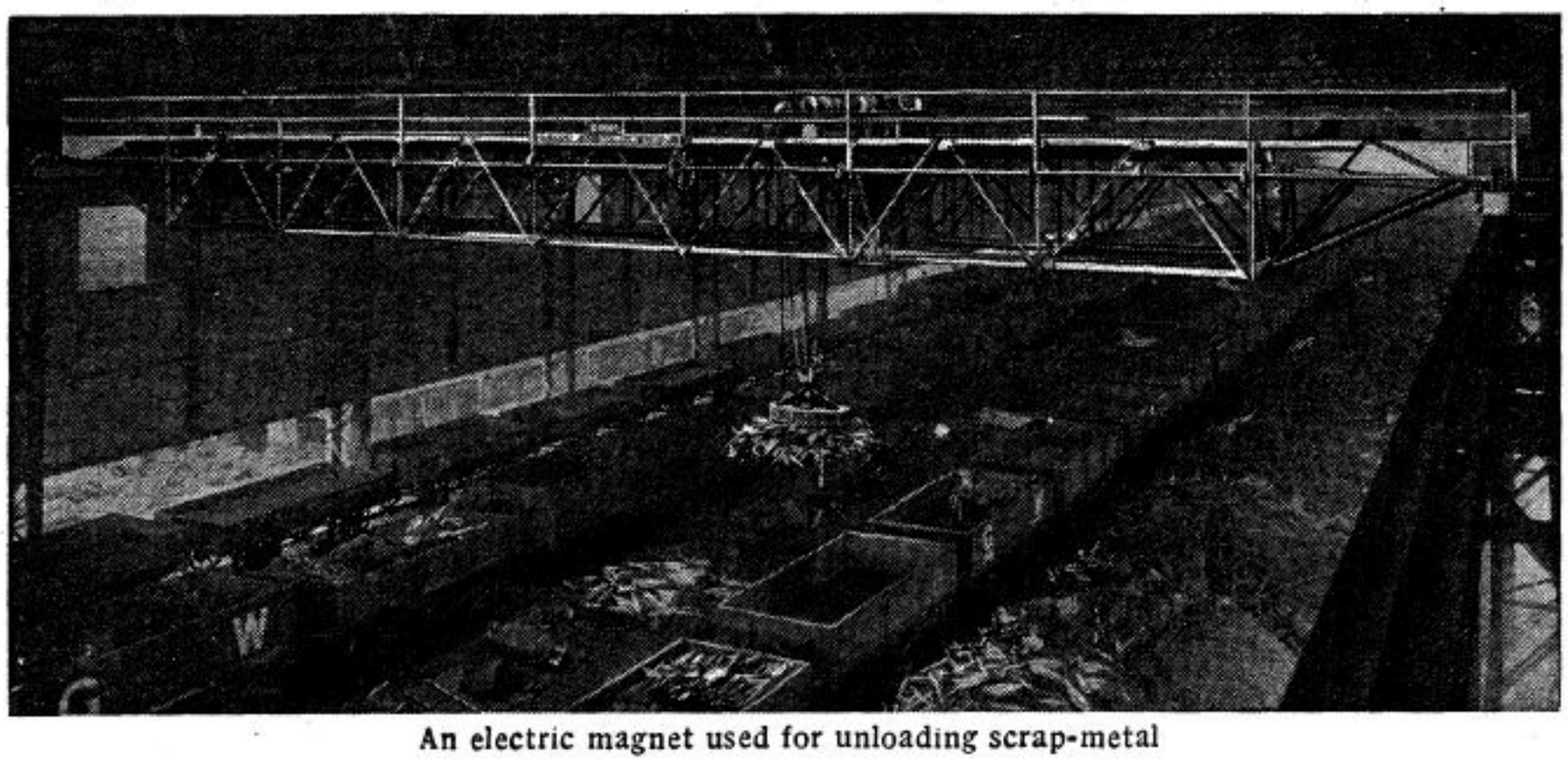
The Story of Where Power Comes From, What It Does, & How It Works



An electric magnet used for unloading scrap-metal

THE OCEAN OF POWER WE LIVE IN

EVERY ship in the world owes its safety and its guidance to the compass.

Every boy and girl knows that a compass needle points to the North. Whichever way you turn, the little compass held in the palm of your hand will show you where to look for the North.

It does so for two reasons. The compass needle is a magnet, and the Earth is a huge magnet ; and magnets affect each other by means of some invisible power which can pass through a stone wall, a glass window, a plate of wax, or any of the simple materials that would entirely shut out electricity.

It is very important to try and imagine magnetism as a force spread out in space, and existing throughout space, no matter what it may be otherwise filled with.

The mysterious force of magnetism was discovered over 2000 years ago by the shepherds of Asia Minor. As we have already seen, on the slopes of the mountains there is found an abundance of hard, black mineral, and the shepherds noticed that bits of this rocky substance would cling to the iron-shod ends of their crooks.

This mineral was an ore of iron, and was found in the district of Magnesia, from which the power of magnetism took its name. The ore became known as the magnes-stone ; then, when it was found that a piece of the stone, if hung on a thread, would always point in one direction, it came to be called the leading-stone, or the lodestone.

There were wonderful legends about the mysterious lodestone in the Middle Ages. Magnetic mountains were supposed to exist which would draw the iron nails out of ships if they approached too closely. Even after the first primitive compasses were made with bits of the lodestone itself sailors would fear that evil mountains of magnetic power would lead the compass astray and bring them to destruction.

The compass first appeared in Europe sometime during the twelfth century. A tiny bar of iron was touched with a piece of lodestone, whereupon it acquired the powers of a magnet, and it was then mounted on a little piece of wood or cork which floated in a dish of water ; later on it was rudely pivoted, but in neither case was there anything to show the points of the compass ; it was merely known that the " needle " pointed North and South.

Now if a magnet, when free to turn, will always point to the two poles of the Earth, we can easily understand that there must be some special power possessed by the poles, and it is not surprising to learn that

the Earth is itself a huge magnet, floating, as it were, in an ocean of magnetic force which we can discover, measure, and make use of at any point on the globe.

To understand how this can be we must first learn how the magnet force of a substance shows itself. The famous Dr. Gilbert, who did so much good work in the early days of frictional electricity, made many remarkable discoveries about the magnet. He found that the power of a magnet has nothing to do with its *shape ;* it may be round, square, or quite shapeless, but it will always display a maximum of power at two opposite spots—the magnetic poles. If you stroke a steel knitting needle a few times from end to end with a magnet, and thus make *it* a magnet, and then roll it in some fine iron filings, you will find on lifting it up that a tuft of filings clings to each end, but that none cling to it anywhere else. All the power seems to pour out of the poles, but the poles are always connected by a field of magnetic power that falls outside the magnet itself, in the form of invisible lines running from one pole to the other.

WHY STEEL HOLDS MAGNETISM AND IRON LOSES IT

One of the most remarkable things about magnetism is that so very few substances can be made into a magnet. In spite of all the scientific research that has gone on, we are left today with nothing more than the iron of the ancient lodestone.

A few other things are mildly magnetic —the metals nickel and cobalt, liquid oxygen, and so on ; but iron is so powerful in this respect that it stands out among metals as absolutely unique. An electric current can turn a lifeless lump of iron into a living giant with more than human strength. A spell can be cast upon a piece of iron which endows it with this gigantic power for just the period an engineer desires ; with a movement of his hand he can destroy its power and leave it a lifeless piece of metal. Soft iron behaves quite differently from hardened steel ; soft iron is magnetic only as long as it is under the influence of another magnet ; steel, once made a magnet, remains so.

We know that iron, like any other substance, is composed of molecules. These molecules, the " bricks " of which iron, and every other substance, is built, are thrown together by Nature with no sort of arrangement, no order. But once the magic influence of magnetism is used on a piece of iron the molecules arrange themselves in line and lie in an orderly manner, all pointing in the same direction. It is this orderliness which is the secret of the magnet. Soft iron is like an undisciplined regiment of soldiers ; once the influence of the master magnet is removed the molecules fall out of place, there is no more order in them, and the magnetic power is lost.

Steel is stiff and enduring ; the molecules, once arranged, never go back to disorder, and so the magic power bestowed on the steel remains. We thus have what are known as *permanent magnets*, of which the horse-shoe pattern is known to every boy and girl. Most children become first acquainted with it when they play with a toy fish-pond—little fishes with bits of iron fixed in their heads, which can be drawn through the water by the power of the horse-shoe.

HOW THINGS ALIKE PUSH AWAY AND THINGS UNLIKE COME TOGETHER

What a wonderful thing it would be if we could see this invisible power at work ! Yet we can actually watch it through the agency of tiny pieces of iron. If we put a magnet under a sheet of paper, and sprinkle some iron filings on the paper, the filings will be drawn to the lines of force or magnetic power of the magnet, and will take up quite definite paths.

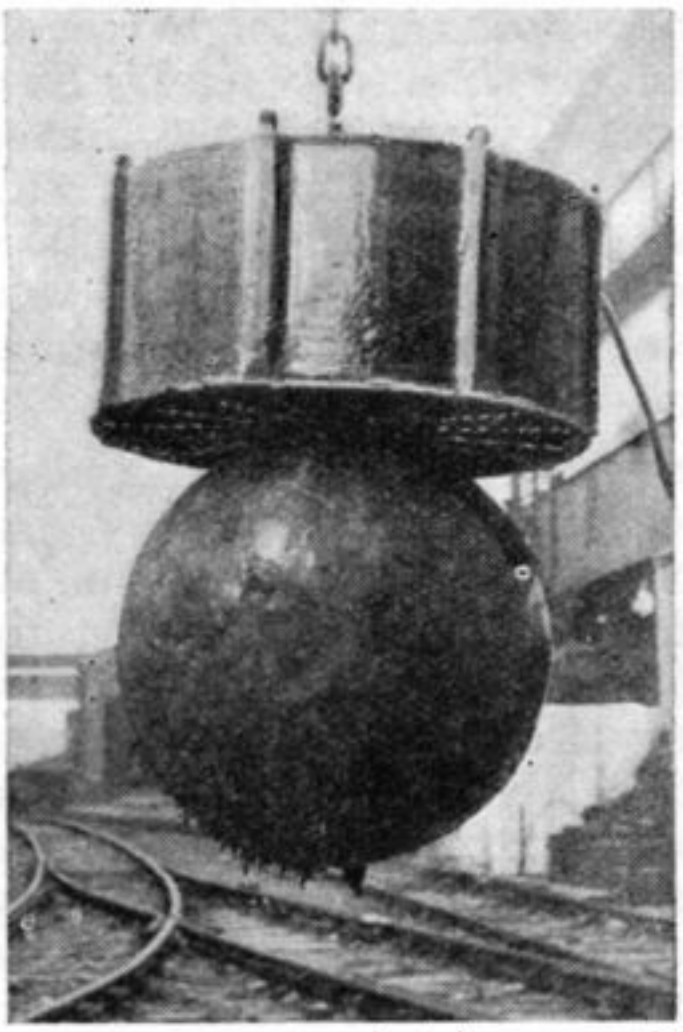
We can not only see that lines of force between a north and south pole seem to show the two poles trying to clutch each other in their eagerness to come together, but we can see the obvious repulsion which one north pole feels for another north pole, or a south pole for a south. The lines of force clearly show what the " like " poles think of each other. Magnetism, in fact, follows the same rules as electricity—like poles repel one another ; unlike poles attract one another.

THE EARTH AS A VAST MAGNET WITH LINES OF FORCE ACROSS IT

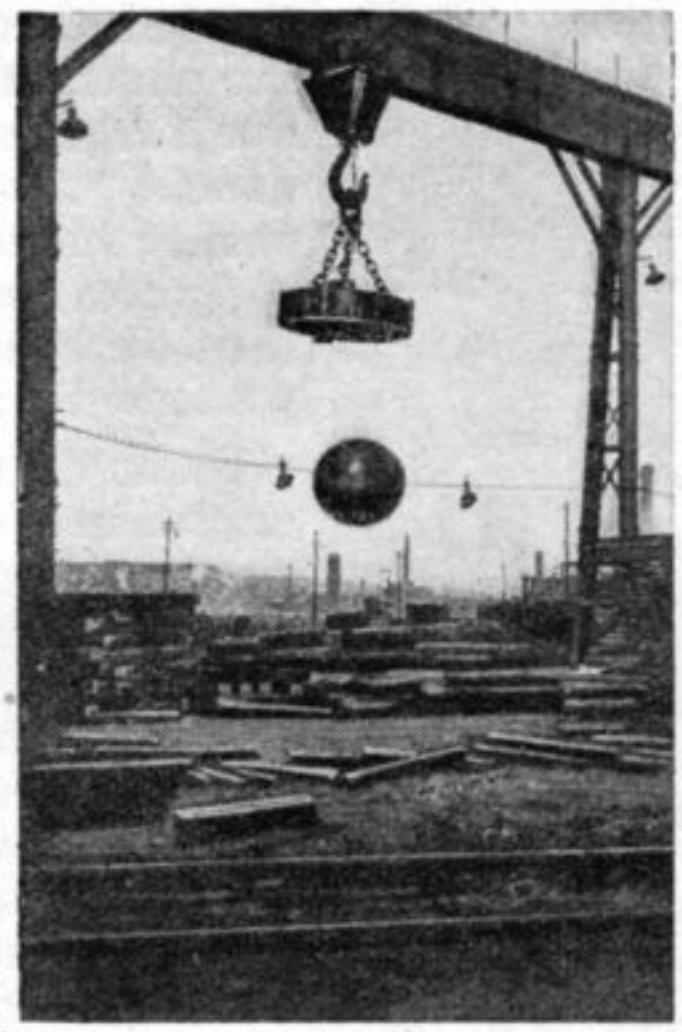
Although the Earth is a sphere, it is also a vast ball-shaped magnet with two ends, each of which is a magnetic pole of opposite properties. We might compare it with an orange, with its stringy core running through the middle. The core itself represents the true magnet, terminating in a top and bottom which are the North and South Poles, and from these poles a field of magnetic force stretches over the skin of the orange. In the Earth this means that lines of force stretch from the northern arctic regions to the South

Pole, so that the whole surface of the world is clothed with a magnetic field which can be measured at any spot, and will always have such an effect on a compass needle that its north pole will point to the top of the core, and its south pole to the bottom.

There is something a little wrong with the Earth in this respect, because the magnetic poles are not quite the same as the actual North and South Poles. A compass needle does not point to the true North, but to the magnetic north, so that a ship which followed a course directed by a magnetic needle would not sail quite in the right direction. The mariner must take into consideration this difference, which he calls the *variation*; more often it is called the *declination*.



An electric magnet lifting a heavy ball used for crushing scrap-metal by falling on it



An electric magnet doing the work of dozens of men

These photographs are of electric magnets made by E. G. Appleby and Company

A wonderful feature of this declination is that it varies from day to day, even from hour to hour. The magnetic poles of the Earth are always changing, ever so slightly, in position. It is as if this immense world-force were fidgeting about in its great prison. In addition to this daily change in position of the magnetic north and south poles there are bigger, but much more gradual, changes, one taking place in a regular way every year and known as the *annular change*, another taking several centuries. In 1580 the magnetic north was more than eleven degrees too much to the east of the true North, as indicated by a compass needle in London; in 1800 it was 24 degrees too much to the West; by 1920 it had come back to within 16 degrees of the true North. This gradual cycle of changes in the position of the magnetic poles was found to take about 470 years.

Another important feature of a compass needle was discovered in 1576 by Robert Norman, an English instrument-maker. He used to make compass needles and balance them in an horizontal position before magnetising them. In this way he discovered that as soon as the needle was made magnetic it no longer remained horizontal, but its north pole always pointed downwards towards the earth. This was afterwards known as the *dip*, and Norman found that in London the angle of dip was about 71 degrees. It is quite easy to see this for ourselves. If a steel knitting needle be suspended by a piece of fine thread tied exactly at the middle so that it hangs parallel with the table, and if the needle is then magnetised by stroking it a few times with a good horse-shoe magnet, it will no longer hang in a horizontal position, but its north pole will point towards the table. In doing this care must be taken that when suspended the needle points due North and South, which it will quickly do if allowed to swing freely of its own accord. The line pointing due magnetic north and south at any part of the world's surface is called the *magnetic meridian*.

No satisfactory explanation of this marvellous natural power has yet been discovered. The strength of the Earth's magnetic field at any spot is certainly slight, but its value is infinite merely because it has made possible the navigation of the seas,

without which there would have been no intercourse between the nations. What could be done were all the magnetic power of the Earth concentrated at one spot? We can obtain a little idea of this when we see what remarkable lifting power even a piece of lodestone has.

Sir Isaac Newton is said to have worn in a ring a tiny lodestone which weighed three grains, and this scrap of magnetic rock could lift nearly 250 times its weight, or 746 grains. A large and powerful lodestone sent by a Chinese emperor as a present to a king of Portugal could lift a weight of 300 pounds. But what must have been the delight of early philosophers when they discovered, by stroking a piece of steel with a bit of lodestone, not only that the magic pcwer was passed on to the steel, but that the lodestone itself lost nothing of its power by so doing! A thousand magnets can be made with a permanent horse-shoe magnet, which becomes actually stronger as the result. Does there not seem to be here a clue to the secret of perpetual motion!

THE MANTLE OF MAGNETIC POWER WHICH CLOTHES THE EARTH

In the beginning of the seventeenth century Galileo discovered this method of making magnets of steel by means of the lodestone, and thus the *natural* magnet gradually gave place to the *artificial* one. Soon afterwards Dr. Gilbert discovered that magnets could indeed be made by means of the Earth's magnetic field, and bundles of thin magnets in this way were bound together, the north poles all at one end and the south poles at the other, and from these stronger magnets were made, and from them stronger magnets still.

We shall see later that by passing an electric current round a piece of iron it can be so strongly magnetised that it can be made to lift far heavier weights than any artificial magnet; the electric magnet has today entirely replaced the artificial steel magnet, except for a few simple purposes and for the mariner's compass.

The mantle of magnetic power with which the Earth is clothed is often upset by changes in the magnetic state of the Sun—itself a gigantic magnet of doubtless much vaster power. Magnetic storms take place from time to time, when the delicate instruments of observatories are much disturbed. Magnetic storms are usually more frequent at times when we see the aurora borealis, or northern lights. The effect of these storms is seen by means of delicate recording instruments, which trace hour by hour the changes in the *angle of declination*. Imagine a delicately-poised magnetic needle on some part of which is fixed a tiny mirror. A spot of light is reflected by this mirror on a moving photographic film which travels at a steady rate by means of a small clockwork motor.

WHAT HAPPENS TO A NEEDLE IN A MAGNETIC STORM

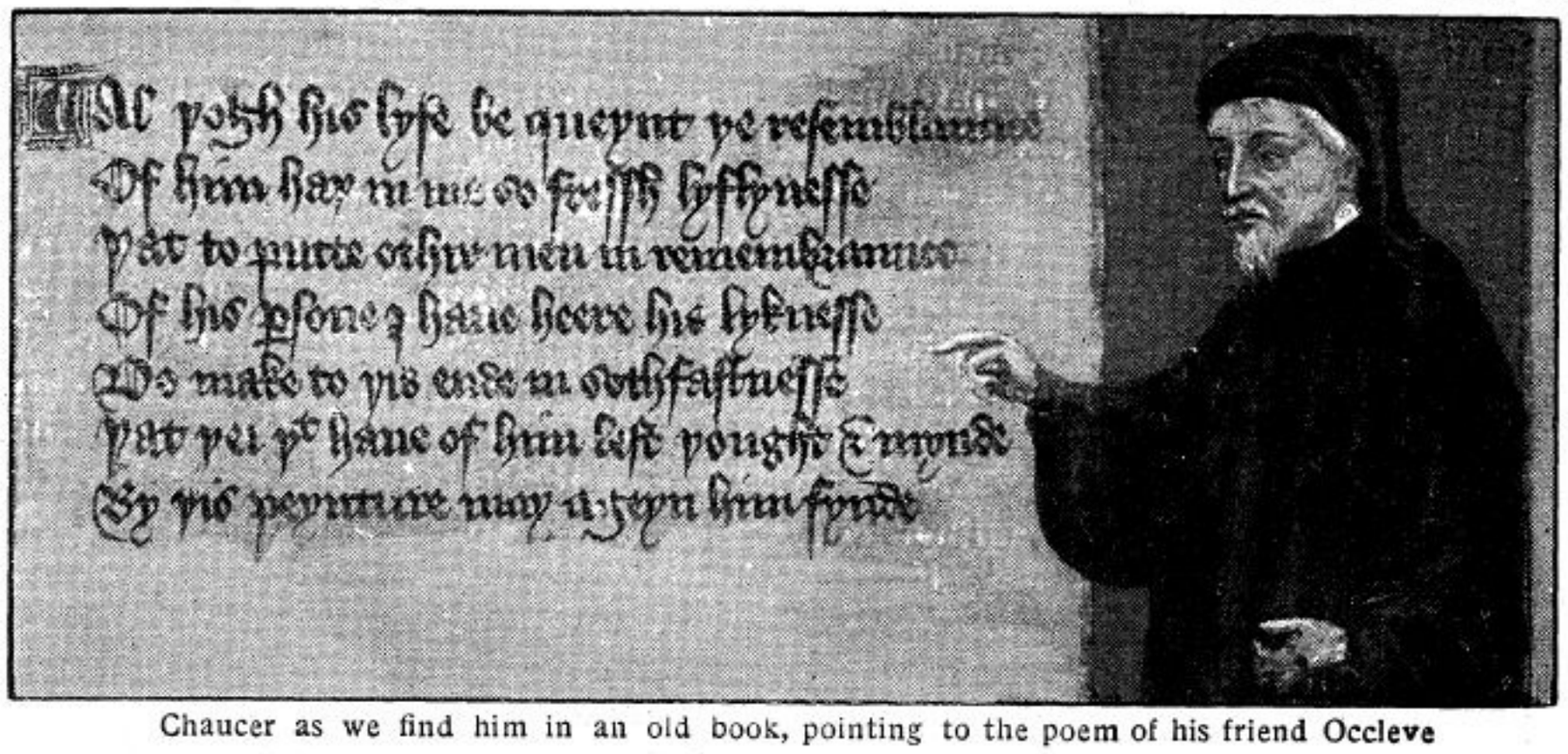
As long as the needle remains steady the spot of light will remain still, and when the film is developed a perfectly straight line will appear in the photograph. During a magnetic storm the declination of the needle will vary, and the needle will move from side to side of the magnetic meridian. Instead, then, of getting a straight line in the photograph, we shall get a zig-zag line, due to the spot of light from the mirror dancing about. In this way every tiny change in the declination of the needle is registered with amazing accuracy, and thus we can obtain records of the effects wrought by all magnetic storms.

Great disturbances of the Earth's magnetism are usually accompanied by disturbances on the surface of the Sun on the same day, and as a rule we are warned of a really big magnetic storm by smaller disturbances which occur three or four days beforehand. These storms are always prevalent and of unusual severity when large sun-spots are observed, and in years of great activity on the Sun's surface the magnetic variations are most marked.

The marvellous displays of light which we see in the polar and northern regions, especially in summer time, are closely connected with sun-spots and their magnetic storms. Many and peculiar shapes are assumed by the northern lights, which gave rise to much superstitious fear before men knew anything of their real cause.

MYSTERIES OF MAGNETISM WHICH REMAIN UNSOLVED

In spite of all the knowledge we have today, of all that modern science has revealed, we are still supremely ignorant of the real causes of natural magnetism and of the things that are wrought by it, and it is only in this century, the greatest century of science, that we have discovered that even electrons in the atom, whirling round in spiral paths with incredible speed, create their own magnetic fields in their tiny worlds.



Chaucer as we find him in an old book, pointing to the poem of his friend Occleve

OUR FIRST STORYTELLERS

THE first Englishman who wrote in our language poetry that is felt to be great used it to tell tales; and the first writer of an English book in prose that remains a great classic work was also a famous tale-teller.

The poet was Geoffrey Chaucer, who died in the year 1400; and the prose-writer was Sir Thomas Malory, who died about 70 years later. These two stand out as founders of English literature, because they wrote in language we can still understand with very little trouble books that will always be read for pleasure.

The two books of old yet living stories, one in verse and one in prose, were among the first to be printed in England by William Caxton, the earliest English printer. Geoffrey Chaucer's Canterbury Tales had been spread about the land in manuscript for 90 years when Caxton printed them in 1477; and Sir Thomas Malory's Morte d'Arthur, of which no manuscript copy exists, was printed in 1485, about 15 years after it was written. Here we start the story of English books by giving glimpses of these two first collections of romances, and by telling something of the men who wrote them.

Geoffrey Chaucer will always be read because his poetry is full of beauty; because very largely he shaped our fine English language into its present form; and because he pictured the English people as they were more than five-and-a-half centuries ago, and has shown us that they were then the same kind of people we are now, with the same kind of thoughts, and caring for the things we still admire.

When Chaucer was a young man of about twenty-two, that was in 1362, the language spoken by the common people of England was adopted, both in Parliament and in the Law Courts, as the official language of the country. Before that, for nearly 300 years, French had been the language of the governing classes.

But it had never been accepted by the mass of Englishmen. The people's older language, however, which we now call Anglo-Saxon, and only understand when we have studied it, had changed greatly, and had absorbed many words from the French; and, as time went on, the kings and governing people felt themselves to be English and not French, and learned the rapidly altering common tongue.

So the time came for a new English, based on Anglo-Saxon and including many words from the French, to be made the standard tongue.

Here was a fine opportunity for a great writer to use this enriched language, and pass it on through books which all would

admire. Chaucer, who was thoroughly English in birth, character, and spirit, was the man who did this. He made the English people proud of their national language as it was used in his books to express every necessary shade of meaning.

OLD CHAUCER'S PICTURES OF THE MEN AND WOMEN OF HIS TIME

He was just the man to do it, for he was in touch with all kinds of people, rich and poor, lofty and lowly. His father was what we should call a London business man. Geoffrey himself was well educated, brought up as a page in a prince's household, with service as a young soldier following in France, where he was captured and then ransomed. Later, he was sent abroad on the king's business to several countries, and afterwards became what we now call a civil servant, and a knight of the shire for Kent, and a member of Parliament. So he was a man of wide experience, acquainted with all sorts and conditions of people.

At first, his writings were chiefly translations from the French, or imitations of French models in poetry. Afterwards he was attracted and influenced by Italian poetry; and it was not till he was forty and had settled down in England that he wrote the distinctively English poems which have made him for ever famous.

Though Chaucer's writings chiefly take the form of tales, it is not his stories that are most interesting to us today, but the pictures he gives of the men and women of his time. And this side of his genius—his observation, humane spirit, and descriptive power—is best seen in the Prologue to the Canterbury Tales.

THE PILGRIMS THROUGH KENT, AND THE TALES THEY TOLD

The shrine of Thomas à Becket at Canterbury was a great place of pilgrimage at that period, and Chaucer, as knight of the shire for Kent, must have been familiar with all the features of the pilgrims' progress, which he finally used as a framework for a number of tales he had been writing for many years.

He imagines twenty-nine people, including himself, gathered at the Tabard Inn, in Southwark, to travel together to the Canterbury shrine, the landlord of the inn acting as guide, and as manager of the procession. To amuse the pilgrims on the journey the landlord proposes that each member of the company shall tell two tales on the way to Canterbury, and two more during the return journey, and that the teller of the best tale shall be entertained at supper by the rest of the pilgrims when they reach the inn again.

Twenty of these tales are told, and four more are left unfinished, or are interrupted. The collection of tales remains a fragment; we do not know who won the supper. Nor does it matter. For it is the array of old-time travellers, and the character sketch of each, that fascinates us—the courtly knight, the lively squire, the honest yeoman, the dainty prioress, the friar, an adept at begging, the Oxford clerk in his threadbare cape, and lean as his horse, the poor parish parson, the lawyer pretending he is busier than he is, the doctor more than half a quack, the pardoner seeking a sale for forgiveness of sin, the country gentleman or franklin, the tax-collector, the miller, cook, dyer, sailor, merchant, wife of Bath. These, with London burgesses, the landlord and the poet himself fill up the human picture, and bring a dead world to life.

THE POETRY THAT IS ALWAYS SMOOTH AND REGULAR

The opening lines of the Prologue show us Chaucer's love of country scenes—a delight he shares with his country's poets, before his time, and ever since; his style in verse; his use of syllables which we do not pronounce; and his accenting of words from the French on their last syllable, where we accent their first syllable.

Chaucer's verse is always smooth and regular. If in reading it we make it limp and hobble we are not reading it aright.

Thus Aprille (April) has three syllables; showres (showers) two; croppes (crops) two; younge, halfe, smalle, fowles (fowls or birds) all have two syllables; while liquor, virtue, Nature, and corages (meaning hearts) are all stressed on the second syllables not the first. If this is remembered, the lines will run and will rhyme quite smoothly.

When that Aprillé with his showrés soot (*sweet*)
The drought of March hath piercéd to the root,
And bathéd every vein in such liqúor
Of which virtúe engendered is the flower,
When Zephirus eke with his sweté breeth (*breath*)
Inspiréd hath in every holt and heath
The tender croppés, and the youngé sun
Hath in the Ram his halfé course y-run,
And smallé fowlés maken melodye,
That sleepen all the night with open eye—
So pricketh them Natúre in their coráges—(*hearts*)
Then longen folk to go on pilgrimages.

Paraphrased into present-day prose, the poet says that when the sweet showers of April have moistened the roots that have been dried by the March winds, and have caused the sap to rise and give birth to the flowers, and the mild Spring wind, early in April, has given life to the tender growths of every wood and common, and the birds make music late and early, scarcely sleeping by night, then Nature also touches the hearts of men, and makes them long to go journeying afield.

With the poetry of Spring then Chaucer begins his poem before he brings his pilgrim company together, in these smoothly running lines.

Befell it in that season on a day,
In Southwark by the Tabard as I lay,
Ready to wenden on my pilgrimage
To Canterbury, with full devout coráge (*heart*)
At night were come unto that hostelrye
Well nine-and-twenty in a companye,
Of sundry folk, by áventure y-fall (*chance*)
In fellowship, and pilgrims were they all,
That toward Canterbury wolden ride.

As a sample of the old-time pilgrims travelling with the poet, and telling their tales on horseback to relieve the tedium of the road, note this:

THE PERFECT, GENTLE KNIGHT

A Knight there was and thát a worthy man,
That from the timé that he first began
To riden out, he lovéd chivalry,
Truth, and honoúr, freedom and courtesy.
Full worthy was he in his lordés werre, (*war*)
And thereto had he ridden, no man ferre. (*farther*)
At mortal combats he had been fifteen,
And foughten for our faith at Tramysene
In listés thriés, and aye slain his foe. (*thrice*)
This ilké worthy Knight had been also (*same*)
Sometimé with the lord of Palatye
Against another heathen in Turkye,
And evermore he had a sovereign prize.
And though that he was worthy he was wise,
And of his port as meek as is a maid.
He never yet no villainy ne'er said
In all his life, unto no manner of wight. (*person*)
He was a very perfect, gentle Knight.

The Knight's son, The Young Squire, is described with equal delicacy and charm.

THE YOUNG SQUIRE

Crulle means curled; delyvere, nimble; chyvachie, active service; space, opportunity.

With him there was his son, a young Squiér,
A lovyere and a lusty bachelor, (*lover*)
With lockes crulle as they were laid in press.
Of twenty years of age he was, I guess.
Of his statúre he was of even length, (*average size*)
And wonderly delyvere and great of strength.
And he had been sometime in chyvachie
In Flanders, in Artois, and Picardy,
And borne him well, as of so little space,
In hope to standen in his lady's grace.
Embroidered was he, as it were a mead (*meadow*)
All full of freshé flowrés white and rede. (*red*)
Singing he was or fluting all the day,
He was as fresh as is the month of May.
Short was his gown, with sleevés long and wide,
Well could he sit on horse and fairé ride.
He couldé songés make and well indite,
Joust and eke dance, and well pourtray and write.
Courteous he was, lowly, and serviceáble,
And carved before his father at the table.

This picture of the character, dress, and accomplishments of a young gentleman of the period has as companion portrait a pen drawing of a lady, a Prioress, whose dainty manners are a guide to etiquette in the fourteenth century.

THE PRIORESS

Fetisly means fluently; ferthing, morsel.

There was also a nun, a Prioress,
That of her smiling was full simple and coy,
Her greatest oath was but by Seinté Loy,
And she was clepéd madame Eglentine. (*called*)
Full well she sung the servicé divine,
Entunéd in her nose full seemély. (*seemly*)
And French she spake full fair and fetisly,
After the school of Stratford-atté-Bow,
But French of Paris was to her unknowe.
At meaté well y-taught was she withal,
She let no morsel from her lippés fall,
Nor wet her fingers in her saucé deep.
Well could she carry a morsel, and well keep
That no drop ever fell upon her breast.
In courtesy was set full much her leste. (*pleasure*)
Her over-lippé wipéd she so clean
That in her cup there was no ferthing seen,
Of greasé when she drunken had her draught;
Full semély after her meat she raught. (*reached*)

The most complete and tender of the sketches is that of the parish parson, the fore-runner of several similar pictures in later English literature.

THE GOOD PARSON

A good man was there of religioún,
And was a pooré parson of a town;
But rich he was of holy thought and work;
He was also a learnéd man, a clerk
That Christé's gospel truély would preach.
His parish'ners devoutly would he teach.
Benign he was and wonder diligent,
And in adversity full patiént.
Wide was his parish, and houses far asunder,
But he nor lefté not, for rain or thunder,
In sickness nor in mischief to visíte
The farthest in his parish, much and lite, (*little*)
Upon his feet, and in his hand a staff.
And though he holy was and virtuous
He was to sinful man not despitous, (*merciless*)
Nor of his speeché dangerous nor digne, (*proud*)
But in his teaching díscreet and benign,
To drawen folk to heaven by fairness,
By good ensample was his business.
A better priest I trow that nowhere none is;
He waited for no pomp and reverence,
Nor makéd him a spicéd consciénce,
But Christés lore and his Apostles twelve
He taught; but first he followed it himselve

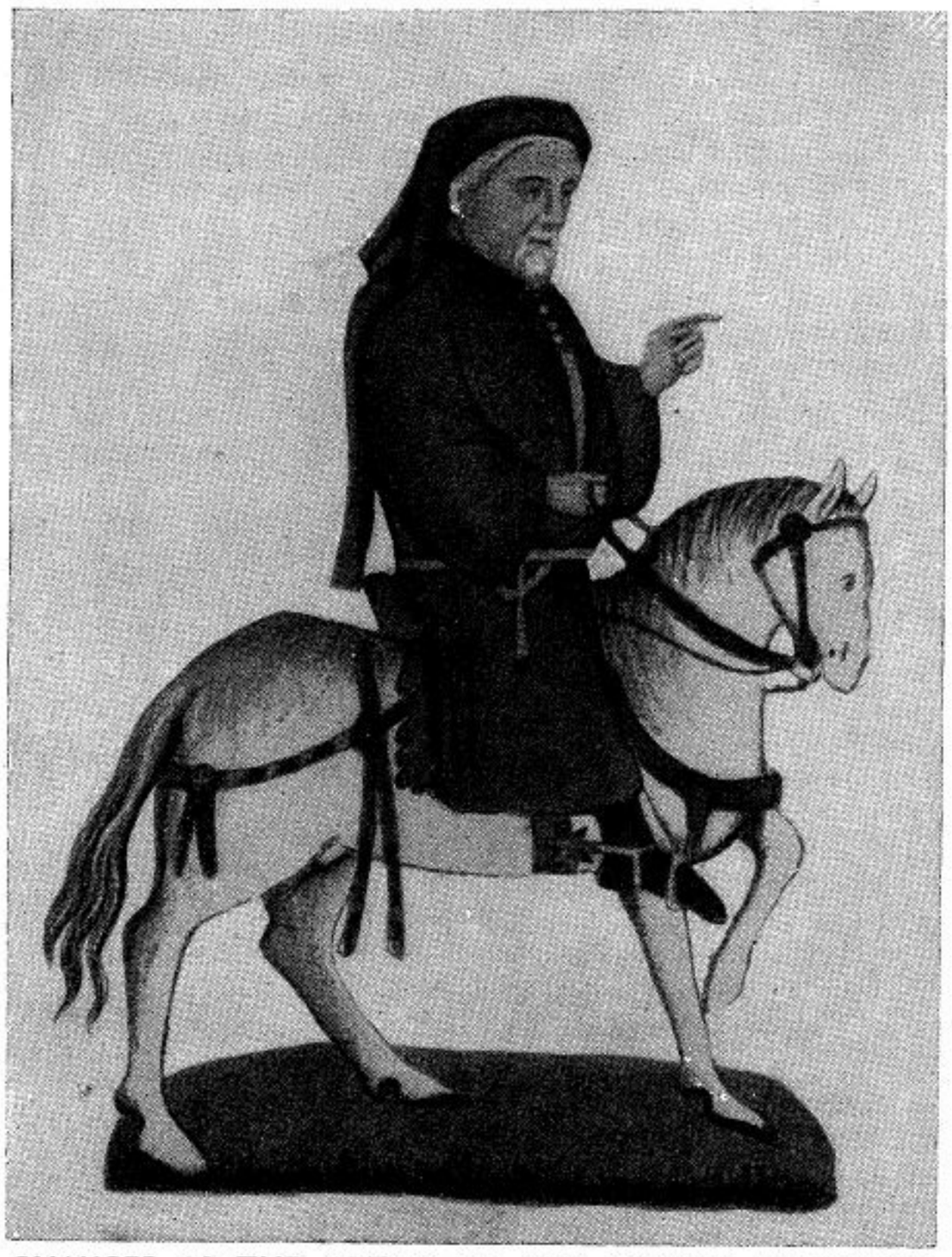
As a character sketch of a common type that of the landlord of the inn is perhaps the most vivid. Big, bright-eyed, outspoken, jolly, he acts as the master of the ceremonies. When he asks Chaucer to tell a tale this is how he calls the attention of the company to the poet.

And then at erst he lookéd upon me,
And saidé thus: "What man art thou? quod he;
"Thou lookest as thou wouldest find an hare,
And ever upon the ground I see thee stare.
Approaché near, and look up merrily.
Now, ware you, sirs, and let this man have place;
He in the waist is shape as well as I;
This were no poppet in arm t'embrace
For any woman, small and fair of face.
He seemeth elvish in his countenance
For unto no wight doth he dalliance.
(*Gossips with no one*)

Chaucer having begun a story in sing-song rhyme the landlord presently stops him abruptly with the words:

Thou doest naught else but dependest time (*waste*)
Sir, at a word, thou shalt no longer rhyme.

Whereupon Chaucer breaks off and tells another tale, this time in prose.



CHAUCER AS THE ARTIST IN THE FAMOUS ELLESMERE MANUSCRIPT DREW HIM

We have another picture of Chaucer sketched by himself in the prologue to his Legend of Good Women.

And as for me, though I ken but lite, (*but little*)
On bookés for to read I me delight,
And to them give I faith and full credénce,
And in mine heart have them in reverence
So heartily that there is gamé none
That from my bookés maketh me to gone,
But it be seldom on a holiday,
Save certainly when that the month of May
Is comen, and that I hear the fowlés sing, (*birds*)
And that the flowrés ginnen for to spring—
Farewell my book and my devotión.

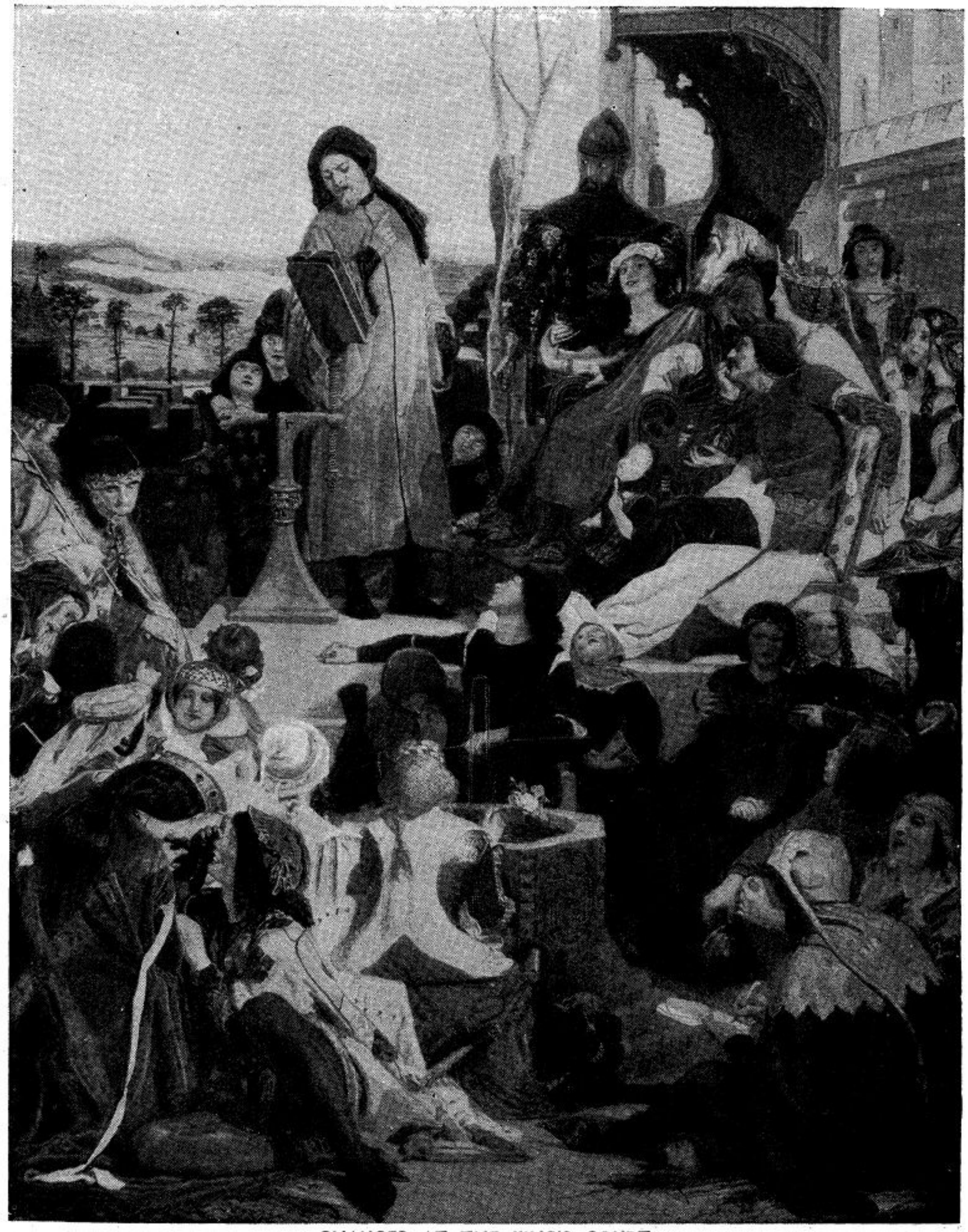
This, then, was the great English poet who, knowing the world, and delighting in the study of his fellow men, and writing with grace and ease, in a spirit of tolerance and kindness, but of sly humour, helped Wycliffe and Malory to give our language its lasting form.

Of Wycliffe something must be said when the literary influence of the English Bible is considered later. Malory has but a dim existence as a man. All his life for us is found in his book describing the romance of King Arthur and his noble Knights of the Round Table.

It may be inferred with confidence that Malory was a Warwickshire knight who, in the Wars of the Roses, supported the Lancastrian side, and when the Yorkists were triumphant, was not forgiven but suffered imprisonment, and illness while he was in confinement. For he turns aside in the story of Sir Tristram to say that sickness is "the greatest pain a prisoner may have." And, again, in the closing sentence of his book, he says:

"I pray you all, gentlemen and gentlewomen, that readeth this book of Arthur and his Knights, pray for me while I am alive that God send me good deliverance, and when I am dead I pray you all pray for my soul."

Apparently while he was in prison he collected French books in which various legends that centred on the life of the half-fabulous British King Arthur were preserved, and occupied his solitude by translating them into English. These legends had passed from Wales into France and

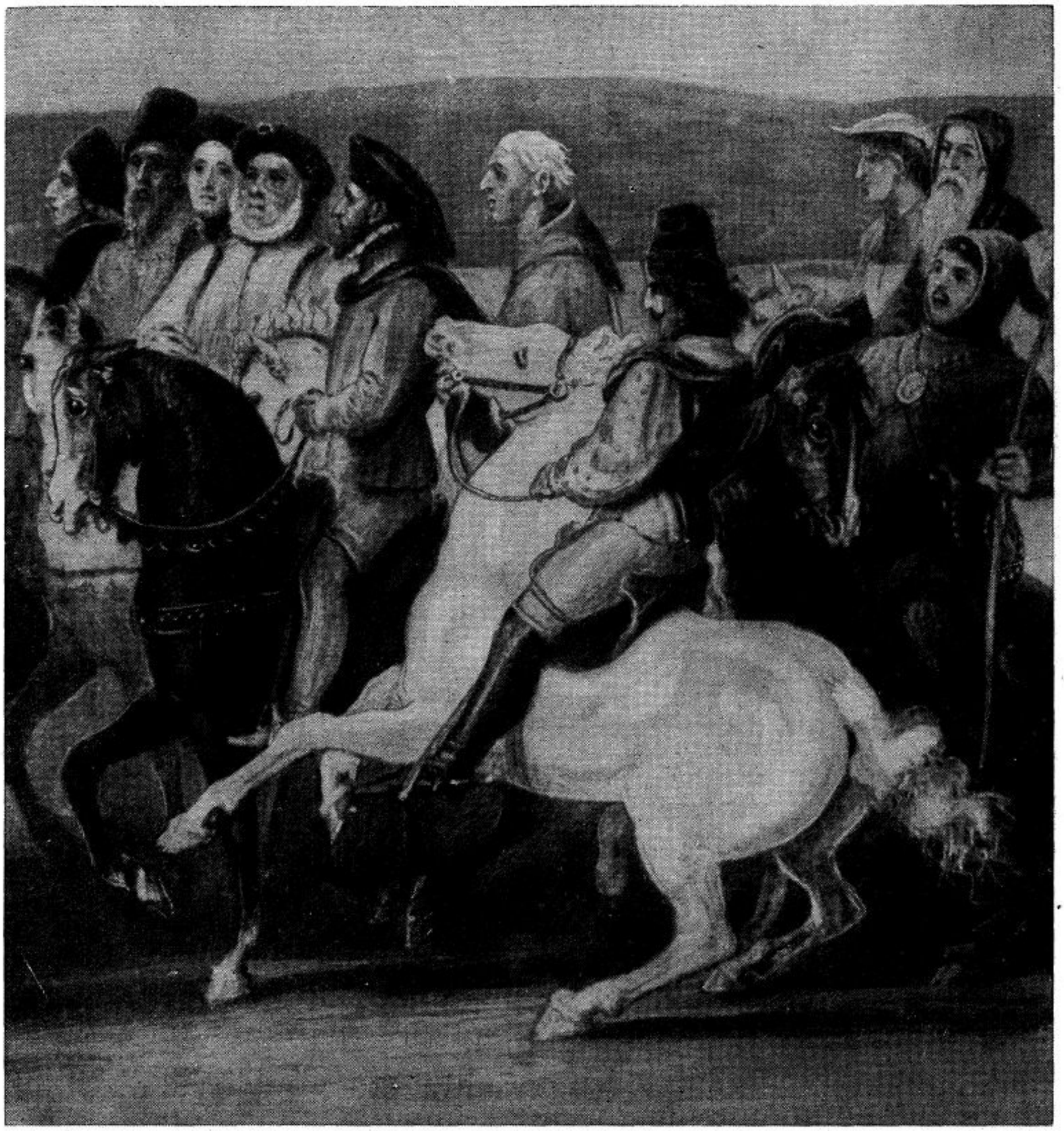


CHAUCER AT THE KING'S COURT

had been developed there by French poets, and Malory brought them back by his translations in a more poetic form, though he wrote in prose, than ever they had worn before.

Whether Malory died in prison is not known. It is clear he had no opportunity of revising his book and removing contradictions and blemishes. Caxton received the manuscript, from an unmentioned source, it seems, after Malory's death, and himself prepared it roughly for publication.

In this way one of the most haunting books in any literature reached the public, and has proved itself a mine of rich, though vague, romance for generations of poets. Milton thought of taking it as the theme of his masterpiece before he decided

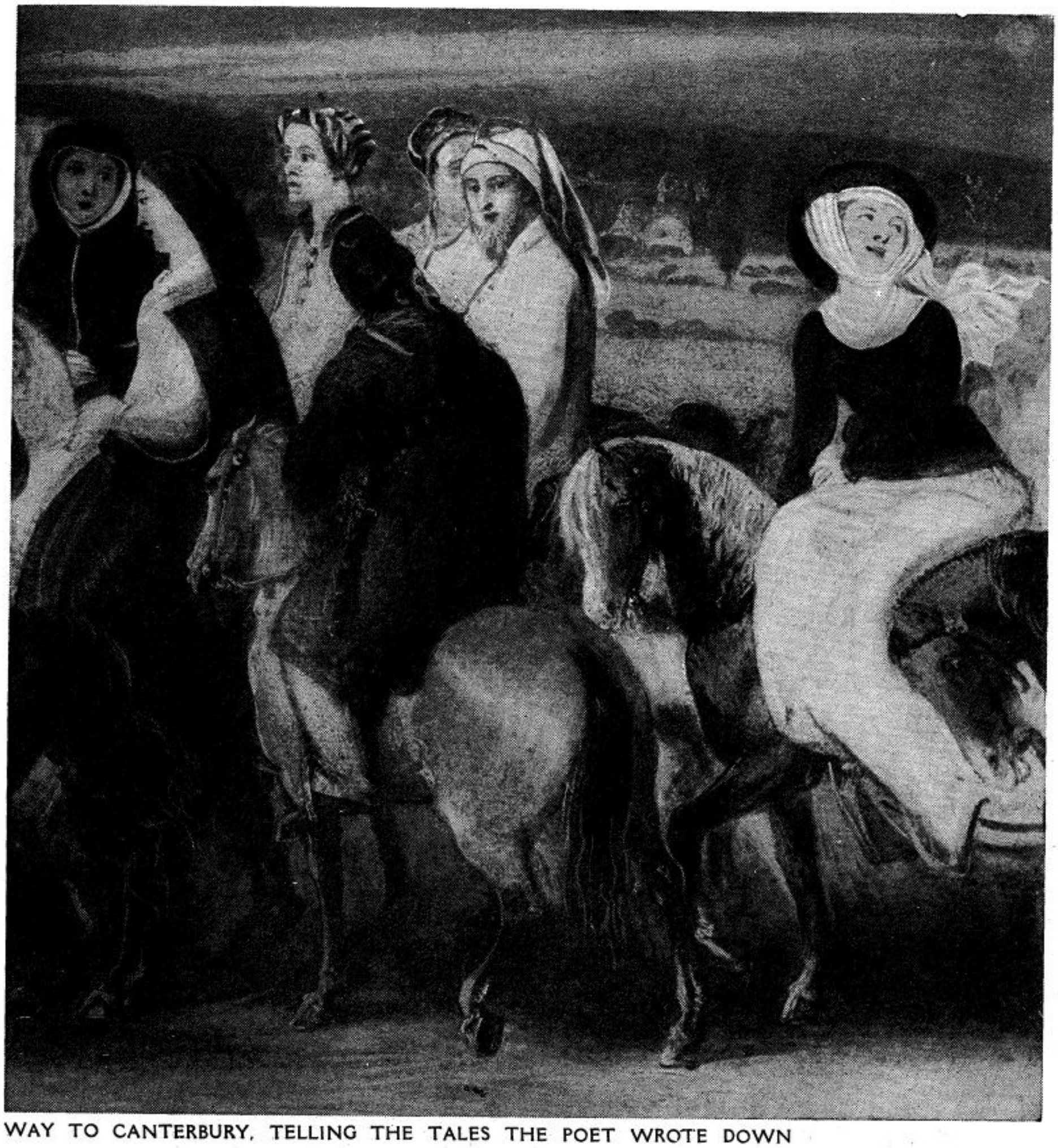


THE JOLLY PROCESSION OF PILGRIMS WHO RODE WITH CHAUCER ON THE

on Paradise Lost. Tennyson has transposed Malory back into verse in his Idylls of the King; but, notwithstanding his skill and all the poetic art of four centuries since Malory, he improved little on the wonderful prose of this pioneer in the writing of simple yet beautiful English.

Many parts of the Arthurian Legend preserved by Malory are shadowy, remote, and unreal if we examine them coldly for facts; but as examples of exquisite English these early simple narratives, almost the first in the slow approach toward modern English, remain unsurpassed, and are equalled only in the lovely language of the English Bible. They should all be read; but as a typical example of his perfect style, here is the last look one gets of King Arthur, the central figure in the many stories that make up his Legend.

Then Sir Bedevere took the king upon his back and so went with him to the water side. And when they were at the water side, even fast by the bank hoved a little barge, with many fair ladies in it, and all they had black hoods, and all they wept and shrieked when they saw King Arthur. "Now put me into the barge," said the King. And so he did softly; and there received him three queens with great mourning; and so they set them down, and in one of their laps King Arthur laid his head. And then that queen said: "Ah! dear brother, why have ye tarried so long from me? Alas, this wound on your head hath caught over-much cold." And so they rowed from the land, and Sir Bedevere beheld all those ladies go from him.



WAY TO CANTERBURY, TELLING THE TALES THE POET WROTE DOWN

Then Sir Bedevere cried, "Oh, my lord Arthur, what shall become of me, now ye go from me and leave me here alone among mine enemies?" "Comfort thyself," said the King, "for in me is no trust for to trust in; for I will into the vale of Avilion to heal me of my grievous wound; and if thou hear never more of me, pray for my soul."

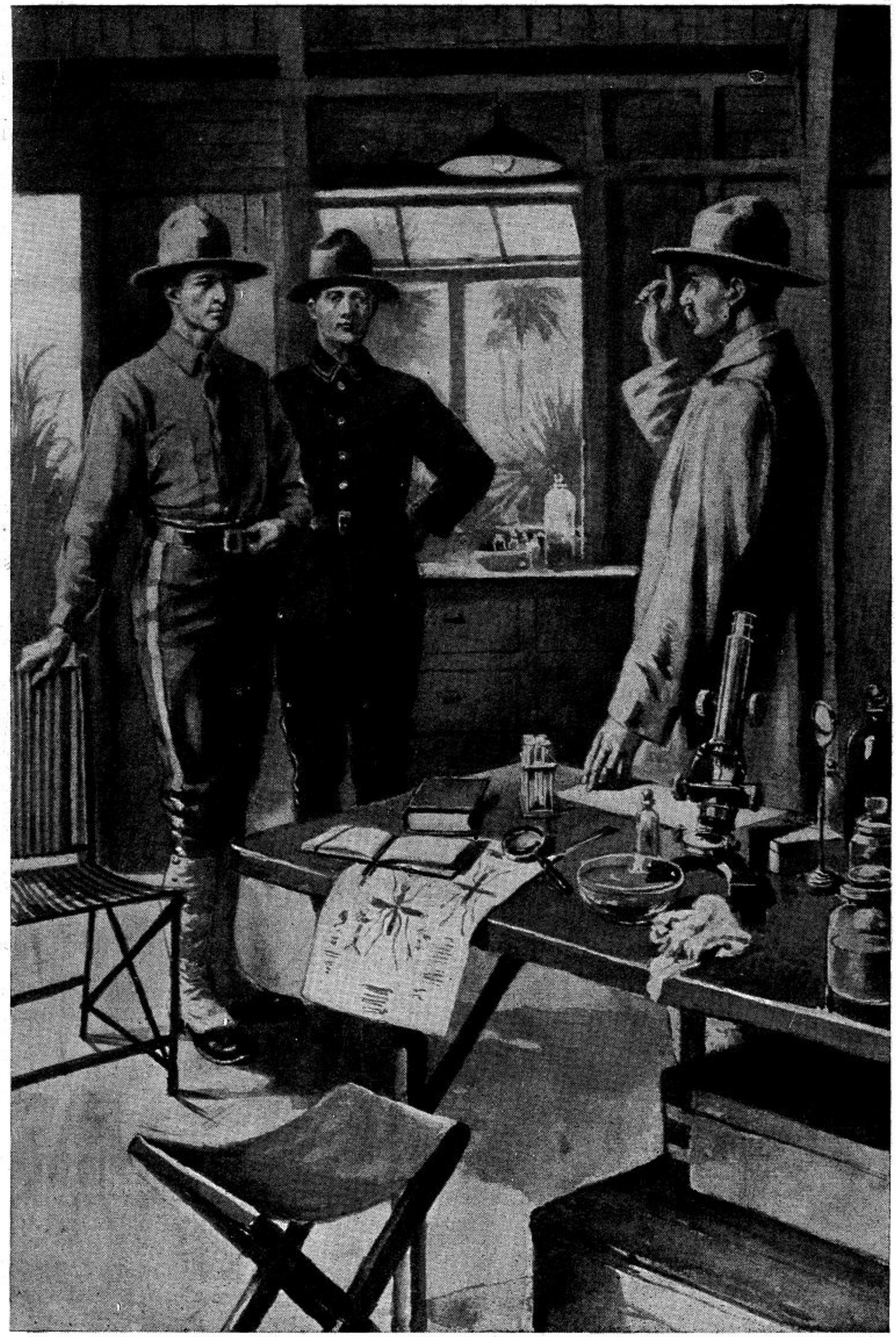
And as soon as Sir Bedevere had lost sight of the barge he wept and wailed, and so took the forest; and so he went all that night, and in the morning he was ware, betwixt two hills, of a chapel and an hermitage.

And read, too, the lament of Sir Hector over his brother, Sir Launcelot.

"Ah! Sir Launcelot," said he, "thou wert head of all Christian knights. And now that there thou liest I dare say thou wert never matched of none earthly knight's hands; and thou wert the courtliest knight that ever bare shield; and thou wert the truest friend to thy lover that ever bestrode horse; and thou wert the kindest man that ever struck with sword; and thou wert the goodliest person that ever came among the press of knights; and thou wert the meekest man and the gentlest that ever ate in hall among ladies; and thou wert the sternest knight to thy mortal foe that ever put spear in the rest."

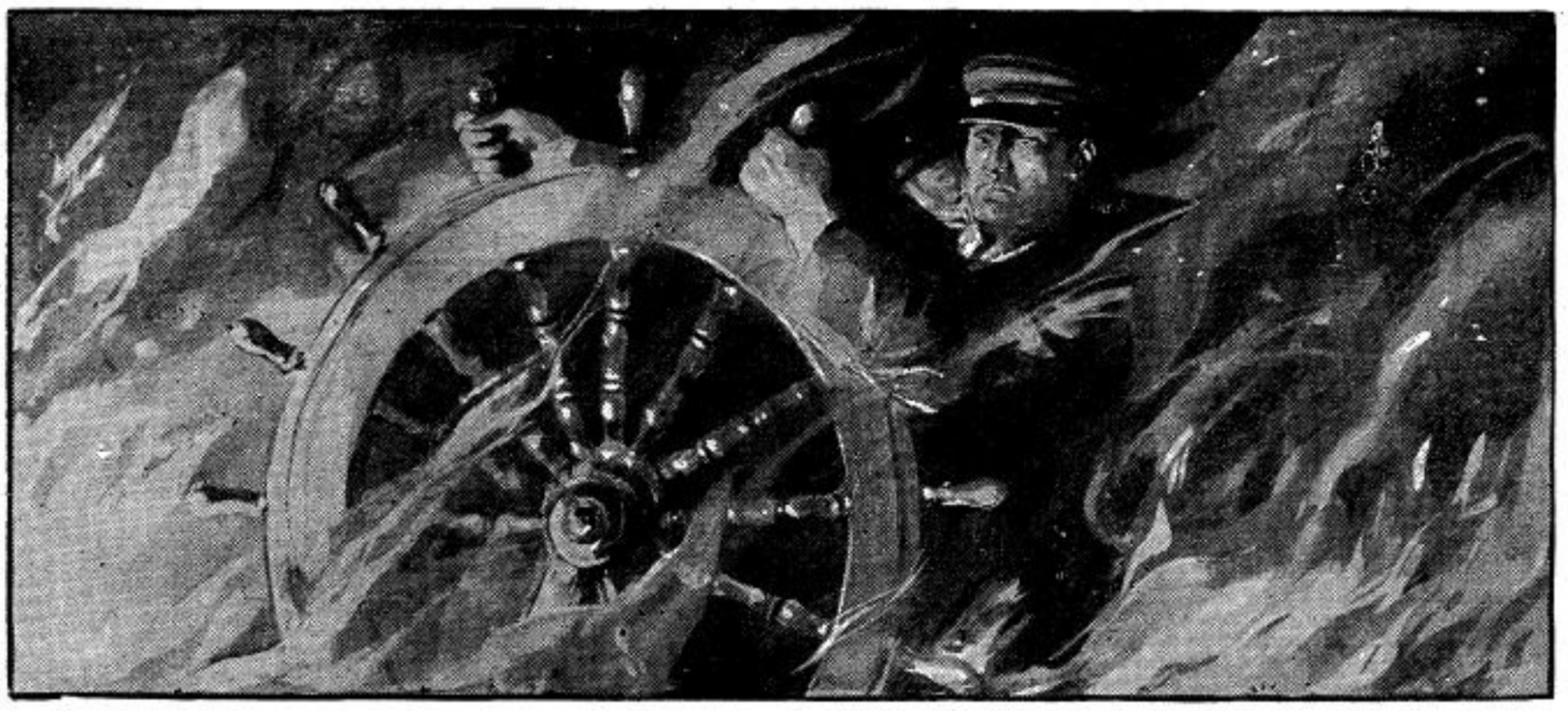
In that tribute to Sir Launcelot may be discovered the qualities which Malory and true knights like him looked for in the best type of men; and in the noble writings of Malory, over four and a half centuries ago, one may hear a cadence that harmonises with the idea then generally held of what a fine man should be.

THE COURAGE THAT GIVES ITS LIFE



"GENTLEMEN, I SALUTE YOU," SAID MAJOR REED TO THE AMERICAN SOLDIERS WHO OFFERED THEMSELVES, AND THEIR LIVES IF NEED BE, TO SAVE THE WORLD FROM YELLOW FEVER

The Great Words that Stir the Hearts and Minds of All Mankind



COURAGE

THERE are many meanings to almost every word we use about human beings, but perhaps there are only two or three of these words which have more meanings than this great and noble word of Courage.

Why is that? You have only to find out the origin of the word to discover the reason. It comes to us from a Latin word *cor*, which means *the heart*. What a thing is the heart of man, how full of power and servitude, of goodness and badness, of love and hate, of the godlike and the beastlike; why, it is a whole world in itself—every emotion is there, every feeling, every thought, every vision, every strength; look into the heart of a man, and you see the history of the human race.

See how difficult it is to use the word justly. Many men have been shot for cowardice in war who were full of superb courage in civilian life. Many a man who fought against terrible temptations in civil life, and who kept his heart pure and his soul unblemished, who was a good man and a noble brother, who lived a life of self-sacrifice and loving-kindness—many a man of this order found it impossible to master his nerves in a great battle during the War, and was shot for a coward.

But it is nonsense to call such a man as this a coward. The word comes too easily to our lips. In the sight of God he was no coward. His fault was simply this, that in an unnatural situation he was unable to control his nerves.

We see at once that this word is well worth thinking about. It is something much bigger than a bottle-fly, and something much finer than the sound of a trumpet. In our first story-books it is a brave and glorious word, warming our hearts, stirring our imaginations, making us long to grow up valiant and unconquerable. We say to ourselves, "I too could face a dragon." And we fall asleep at night dreaming that we have drawn a sword against a giant, and that behind the giant are seven roaring lions, each of them more terrible than the other, all of which must be killed by us before we can rescue the enchanted princess from the castle. A grand thing is courage!

But later on we get a little tired of this courage, and when we are old enough to think about the words we use, ceasing to speak like parrots, we find that this word courage is like a house of many rooms, each room different from the rest, and all of them leading us on and on till we come to a roof which shows us nothing but the stars.

Let us enter the first of these rooms. There is the daily courage of the miner who descends into the darkness of the

earth and burrows his way for many miles through tunnels, the roofs of which are propped up by logs of wood. There is the courage of the diver who descends to the bottom of the sea, and whose safety depends on a frail mechanism which provides him with air from above. There is the courage of the fireman who faces a tempest of flame to rescue a child's life. There is the courage of the airman flying a new machine, and the courage of the crew of a submarine going down to the depths of the sea. And there is the simple, unheroic-looking courage of the policeman who stands in the midst of the racing traffic of crowded roadways directing the vehicles this way and that.

THE COURAGE OF INQUIRY THAT MAY KILL THE INQUIRER

Pass into another room and you find a man injecting into his veins a fluid which never before has entered the human body. He believes he has discovered a cure for some deadly disease. But he does not know that his cure will work. There is only one way to that knowledge. He must risk his life to prove it.

Enter another room: three men, like skeletons, are huddled up in furs, starving to death. One of them is writing to a friend in England, the creator of Peter Pan, and his pen sets down these words: "We are pegging out . . . feet frozen, no fuel, and a long way from food; but it would do your heart good to be in our tent, to hear our songs."

Enter another room: a man is here doing some hard and laborious work, which he hates, which he knows can never give him pleasure or satisfaction—dull, dreamy, meaningless, mechanical work.

THE GREAT COURAGE THAT SMILES TO HIDE THE AGONY WITHIN

And his whole outlook is hopeless. At such work he can never rise to be anything else. To the end of his days he will have to go on doing this dull and dreary thing—never something else, never something that he wants to do. Why does he stick to this dull work, cheerfully, happily, making the best of a bad job? Because it brings him wages, and with those wages he can keep his children in decency and happiness, bringing them up to love life, and keep their hearts unspotted from the world.

Enter another room. A child is lying in bed, very pale and very thin. The mother is there at the bedside reading to the child a funny story. Every now and then she comes to a picture and shows it to the child, and asks: "Look, darling, isn't this a funny picture?" and no one could tell from her voice or the look in her eyes that her heart is breaking. The doctor has told her the worst. But she goes on amusing the child, keeping a brave face, though her agony of soul and brain is greater than any language can express.

Enter another room. It is filled with people who are very happy and playful together. They are wonderfully kind to one another, and yet there is a good deal of chaffing among them, particularly of those who happen to complain. The great thing in this room is to be lively in a subdued way, to tease your companions in a friendly manner, and to be extremely interested in books, or politics, or flowers, or clothes, or even food. And these people are called by a very tragic name, and they live together in a house which has a very tragic name. They are Incurables, and the house is called a Home for the Dying.

Now we come to a room which calls for shrewd observation. Do not let us speak until we have looked about and made quite certain that we know what it is we have to do with. A man is here with a rifle. He stands by the window, peering out wild-eyed at the people in the street. He has opposed himself to the will of his nation. He says they are wrong. He will die rather than submit to them.

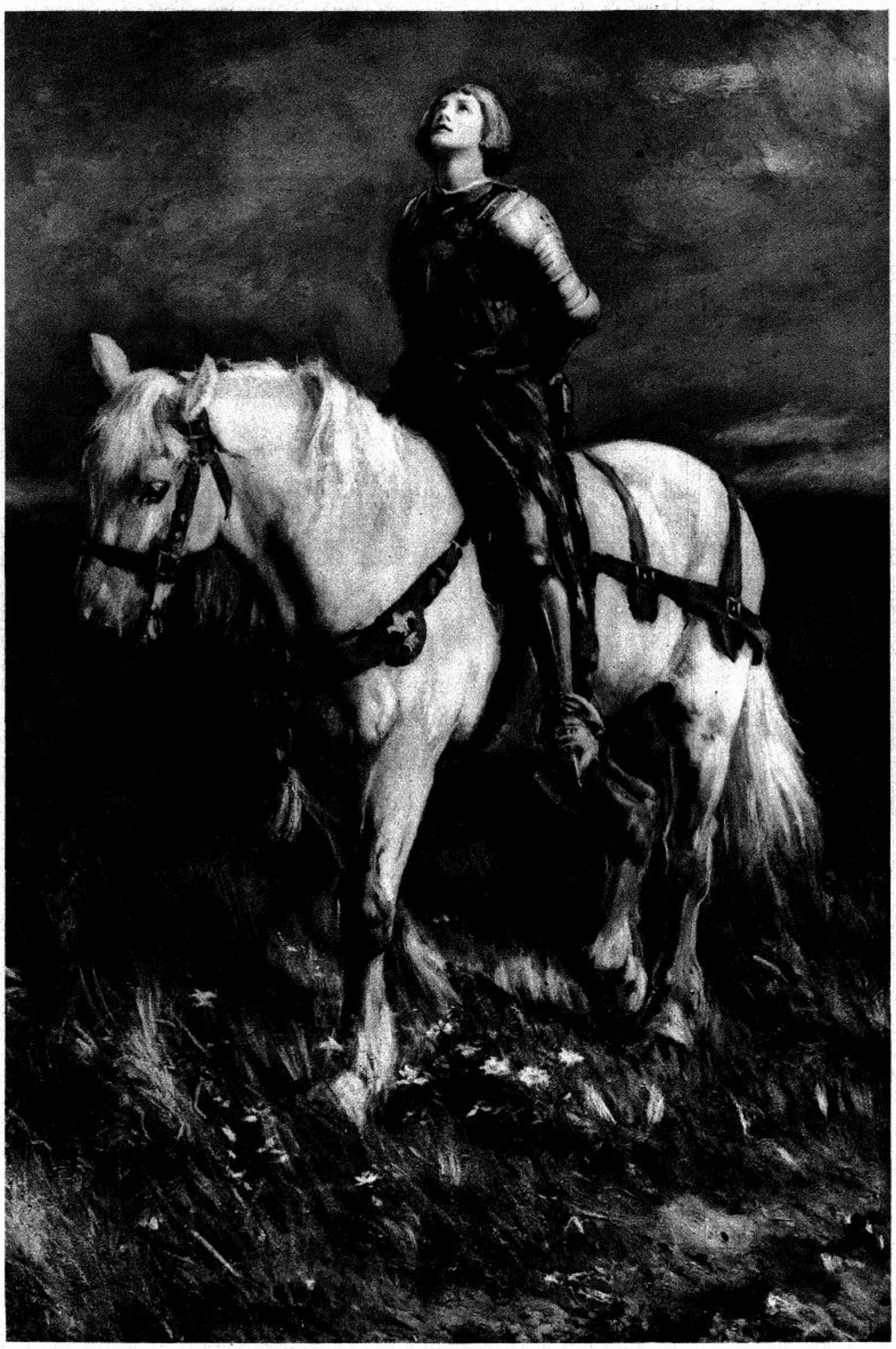
THE PEOPLE WHO THINK THEY ARE COURAGEOUS IN STICKING TO AN IDEA

What courage! you say. Are you quite sure? Look at the man more closely. Does he strike you as one likely to be right? Is there not something feverish in his eyes, something terribly like arrogance on his lips? Does he not seem to you more like a fanatic than a hero?

That is one of the dangers of this great word—it can give a sort of glory to obstinacy, can throw a sort of halo round pigheadedness. A man may show courage in a bad cause. A man may be marvellously brave in stupidity.

Suppose we found a man who was drinking himself to death, who was impoverishing his family, and bringing dreadful dishonour on a noble name. And suppose we brought doctors to him who proved to him that he was drinking himself into madness and death, and he laughed at them and exclaimed: "I don't

THE RIDE TO THE VICTORY OVER DEATH



THE BRAVEST GIRL WHO EVER LIVED—JOAN OF DOMREMY, THE STAINLESS MAID OF FRANCE

This fine painting by Roland Wheelwright is from a photograph by the Autotype Company

TO FACE PAGE 373

care ; I am not afraid of madness or of death ! " Should we say he was brave ?

So, in like manner, you may find in the world people who think they are courageous because they stick to an idea in politics or religion which appeals to them, and which they persist in saying is a right idea and a true idea, although the whole world is against them. These people do not care how much misery they cause to other people. They see poverty widening around them. They see murder on every hand. They see cruelty and brutality on every side of their cause. But they still persist in saying that they are right.

THE POOR SORT OF COURAGE THAT IS BOLD IN DOING WRONG

We realise at once how courage can be debased. It is like music, or literature, or religion : it can be used for wrong things. There is music, like Handel's, which almost seems to prove that we are spirits from heaven : and there is music made by Negro bands which to us is hideous, stupid, horrid, and base. A book by one author makes you feel you will always be your best ; another makes you feel it does not matter whether you are good or bad.

This is one of the most arresting thoughts that can enter your mind—the power of man to use a sublime thing for a bad purpose. You know that the coinage of a country must be genuine if life is to flourish there, and you know that there are men who make bad coins in order to enrich themselves, never mind how many people they make poor in consequence. So it is with the whole world. It is essential to our safety that we should cherish good thoughts, and keep the moral law, and think more of other people than of ourselves. But there are people who say : " What do I care for the rest of the world ? I will do whatever I like ; " and what they like is bad, and dangerous, and fatal to the world's happiness.

UNSELFISHNESS THE GREAT TEST OF THE TRUEST COURAGE

True courage lies in the suppression of self. That is the essence of it. Wherever self enters it is a questionable courage. Wherever selflessness is the heart of it, there you may be certain the courage is fine. Wonderful is this test of all truth. We may deceive ourselves here and there, but everybody knows when he is truly unselfish.

There is another form of courage which is worth looking at. We call it Spartan courage. The Spartan mothers told their sons when they went into battle that they were to come back either with their shields or on those shields, that is to say, as victors or as dead. The mother of John Wesley was a veritable Spartan ; she used to whip her children till they could bear pain without weeping.

A few years ago people used to say that Spartan courage was a fine thing. We are not so certain about it now. We are inclined to think that a hardening of the nerves is not good ; that to blunt the senses is to spoil the fineness of the spirit. We say that endurance is a noble thing, but that it is only at its highest when the nerves are sharp and sensitive.

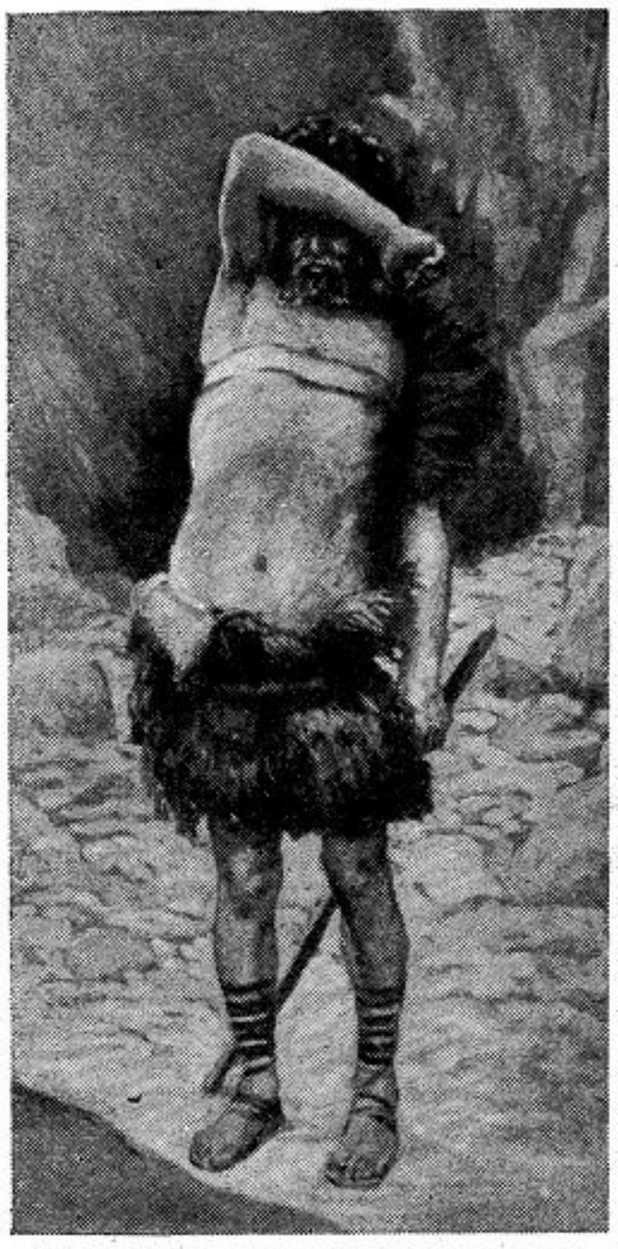
Some people do not feel pain. Some people do not hear a discord in music. Almost any child can be trained to bear pain without a whimper, but many a child brutalised into such a state of insensibility never knows the highest and rarest pleasures of human existence. Courage of this order does not move our admiration. We say that the brave soldier is he who wants to run away and does not. When a man tells us that he does not know what fear is, we do not feel that he is a brave man ; we know he is a man with no imagination.

THE MOST BEAUTIFUL COURAGE THE WORLD HAS EVER KNOWN

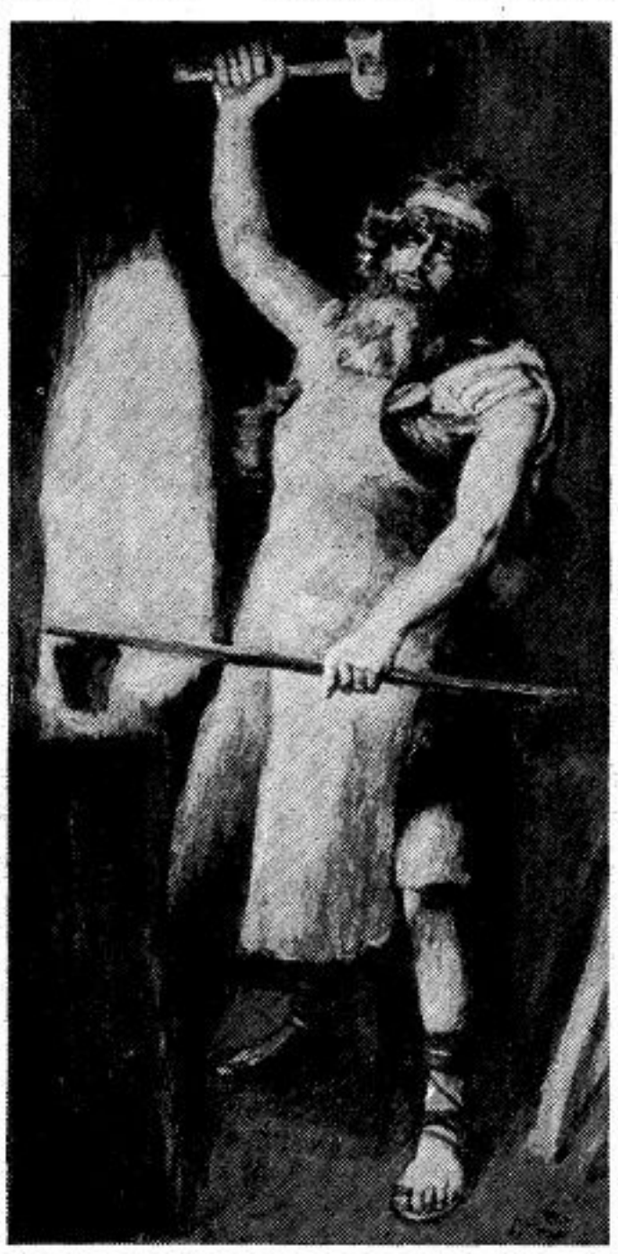
Compare such courage with the purest and most beautiful courage the world has ever known. There once lived on this Earth a Being who had no thought in His heart except love. He loved children, He loved flowers, He loved birds. So wonderful was His love that he could look through the sin to the heart of the sinner and love that poor troubled heart. He was gentle, tender, compassionate. Everything we can think of as beautiful and gracious was in His soul. Yet, for the sake of His idea, the idea of love, He laid down His life. In silence and in meekness He laid it down. He fell into the hands of a brutal soldiery. He suffered every ignominy that flesh can bear. He was reviled, scourged, beaten, spat upon, and finally put to a cruel and lingering death—this gentle and tender creature who shrank from all pain and all cruelty. And He prayed for those who mocked him as He died, prayed for those who spurned His idea that love alone can save mankind from desolation.

This is the courage which unveils for us the stars of God.

THREE MEN OF THE EARLY DAYS



CAIN WHO KILLED HIS BROTHER



TUBAL CAIN WHO WORKED IN BRASS

NOAH WHO BUILT THE ARK

THE BUILDING OF THE ARK

The Story of the Most Beautiful Book in All the World

The First Rainbow—By J. James Tissot

THE STORY OF CAIN AND ABEL

Two sons were born to Adam and Eve. The first was named Cain; the second, Abel. Cain worked as a gardener; Abel was a shepherd.

The two brothers heard from their father and mother about God, and they felt how good it was to worship the great Creator of the Earth.

But there was a difference between the characters of these two brothers. Cain, as he dug the soil and tended his plants, thought of God as a great and terrible King. Abel, as he wandered through the valley with his flocks, thought of God as a kind Father. Cain was half afraid of God; Abel loved his Maker.

Now, the way these two men worshipped God was by sacrifice. That is to say, they gave up something which was theirs, and offered it to God. In our day people give up money for God, or proud positions, or pleasures, and serve Him humbly by helping the sick, the sorrowful, and the needy. Cain gave up some of his fruits and Abel gave up some of his flocks.

But Cain's sacrifice was made grudgingly. It was a sulky gift. He gave because he was afraid not to give. Abel, with purer heart, gave of his very best to God, and gave cheerfully, because he loved God and trusted in His goodness.

And when Cain saw that Abel's sacrifice was better than his, instead of making his own like to it, he hated Abel.

He would think bitterly of Abel as he dug in his garden or walked home through the fields at sunset. He would hate him for being better than himself.

And so long did he dwell on this angry thought that at last he could think of nothing else. Directly he thought of his herbs, his thoughts flew to Abel; directly he thought of God, his thoughts flew to Abel. Eating and working, resting and sleeping, his thoughts fastened themselves like a swarm of angry wasps on the beautiful character of his brother Abel.

One day they met in the fields, and talked together. Soon the talk became an argument. In the midst of the argument rage suddenly seized upon Cain. He felt his brother to be a better man than he. The thought was more than his wicked temper could bear. With a wild and desperate fury he sprang upon his brother, struck him, and killed him.

In an instant the voice of God sounded in his soul:

"Where is Abel, thy brother?"

"I know not," he cried back. "Am I my brother's keeper?"

But the Voice in his soul continued:

"What hast thou done?"

And Cain knew that he had done *murder*. The Voice spoke again, and spoke of another voice which Cain himself could hear. *The voice of thy brother's blood crieth unto Me from the ground.*

Cain knew then the horror of his crime. He had done something which could not be undone. A moment before Abel had been a living man ; now he lay dead and still. Cain could never restore him.

With a bitter cry of agony he called upon God : " My punishment is greater than I can bear."

He went forth a fugitive. Henceforth there could be no rest for him ; no hours of peace and contentment ; no days of happiness and joy. On his soul was the mark of murder. In his mind was the voice of his brother's blood. In his heart was despair.

Though Cain had such a sad story, his family recovered its position among men in the sixth generation, when Tubal Cain became the inventor of metal working and of stringed musical instruments.

The first crime told in the Bible is the crime of murder, and that crime was caused by the same spirit which makes people today wish to be richer, grander, cleverer, and prouder than their neighbours. God's law is that we shall be unselfish, and love one another.

THE BIBLE STORY OF NOAH'S ARK

It is sad to read in the Bible that men and women became so wicked that God was sorry He had made the Earth.

The Bible story tells us that God looked at the way men and women were living, and determined to punish them by sending a great flood ; but that, for the sake of one upright man, God saved the Earth from destruction. This man was Noah.

He called Noah, we are told, and bade him build a great Ark out of gopher wood, with rooms in it for his wife and his sons, and his sons' wives ; with one great window and with a mighty door in the side. The Ark was to be covered with pitch inside and outside, and to be built so well that it should have room for two of every living thing, with food for each one.

Noah, having made the Ark, called two of every living thing upon the Earth — animals, birds, and insects ; and, laying in a great quantity of food, he himself, and his wife and his children, with all these other living things, entered the Ark. The Bible tells that, when they were all entered in, the springs of the Earth and the fountains of the sea burst their bounds, the windows of the heavens were opened, and the water covered the highest mountains. And in the flood the wicked perished.

THE DOVE THAT RETURNED NOT AGAIN
From the painting by G. F. Watts, R.A.

But God remembered Noah. The rain ceased, the waters passed away, and the sunlight entered into the Ark.

Then Noah let a raven fly from the window of the Ark, and it did not come back to him. Noah then sent out a dove, but the dove flew terrified above the waters, and returned to the window of the Ark. After seven days more Noah sent out the dove again, and this time it returned bearing in its beak a leaf of olive. Noah then knew that the Earth was dry, and when he again sent the dove forth it did not return.

Then Noah came out from the Ark with his family, and on an altar of stones they offered thanks to God. So God was pleased with Noah, and set a bow of light in the sky after the rain. That is the Bible story of the first rainbow.

MAGIC FROM A WAND

As soon as the young wizard aspires to give a regular performance he will feel the need of a proper wand.

The wizard's wand, indeed, is a very important part of his outfit, for it serves several purposes. Though the spectator may be conscious in his own mind that it is a mere piece of wood, a mystic tap with the wand, for the professed purpose of causing some magical change, goes a long way to make him believe that the change was actually produced. Further, when necessary, the owner is enabled, by grasping the wand, to keep the hand partially closed, and so to conceal some small object.

The young conjurer should therefore cultivate the use of the wand. A handy boy can easily make one for himself. Nicely rounded rods of hard wood, three feet long and half an inch thick, are sold by most ironmongers for a few pence. Get one of these, cut from it a piece about twelve inches long, and cover it with black glazed paper. Over the last two inches of each end paste the same sort of paper, but white or cream in colour, and we shall have a wand as good for practical purposes as if it were made of ebony and ivory.

One very effective plan is to produce it from our purse, where we profess to keep it, along with our hard-earned pocket-money. Coming forward, and making a few introductory remarks, we look about us, as if seeking for something. "I am sorry, ladies and gentlemen, but I have mislaid my wand; till I find it I cannot do anything. Ah! I remember now, I put it in my purse." And we produce it from our purse accordingly.

We have to admit that the last statement is not strictly true; but, as a conjurer we have a sort of special licence to romance in this way. As a matter of fact, the wand is not yet in the purse, but is hidden in our left sleeve, its outer end resting against the lower joints of the bent second and third fingers. If the first and fourth fingers be left partially extended the curvature of the other two will appear perfectly natural.

We have two purses, bag-shaped, and alike in appearance. One of these is unprepared, but the bottom seam of the other is ripped open for about an inch and a half, making a secret passage into the interior. The inner pocket remains intact, and in this we place a few coins. The other purse is left empty. The two are placed, one against the other, in the left trouser pocket. We must remember which is outermost.

To work the trick we place the left hand in the pocket, and take out the prepared purse. Transferring it to the right hand, we open it and pour out the coins upon the table. Returning it, still open, to the left hand, and placing the fingers of the right hand inside, we take hold, through the opening, of the end of the wand, which we then draw out through the mouth of the purse.

If we do this neatly, standing with our left side toward the spectators, no one can detect that the wand comes from the sleeve.

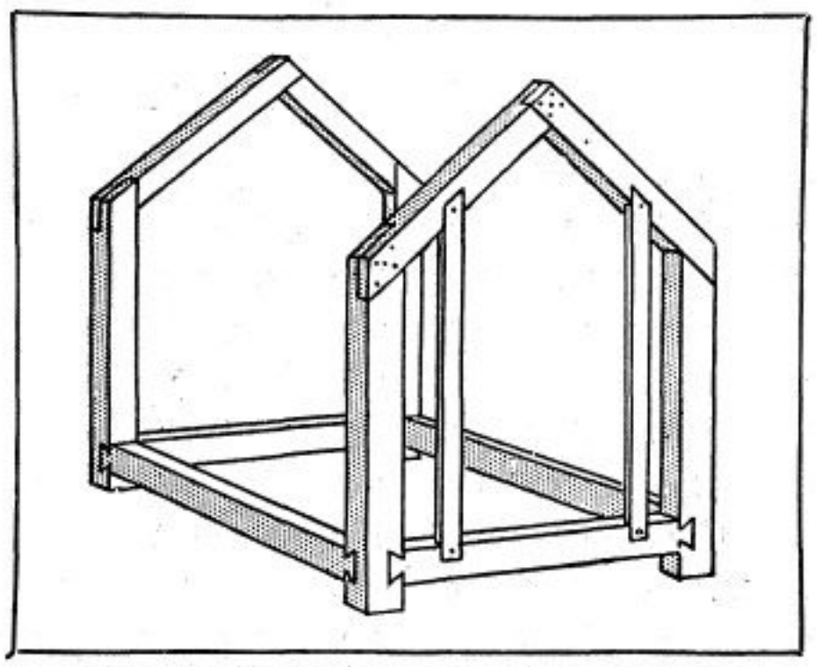
When the wand is clear we close the purse, put it back into the pocket, and remove the hand. Then we say: "I mustn't forget my money, though." We thrust our hand into the pocket again, and bringing out the *unprepared* purse, place the coins therein.

We must not offer it for inspection, but if any inquisitive person asks leave to examine it we may safely let him do so.

MAKING A KENNEL FOR A DOG

THE size of the dog-kennel will of course depend upon the size of the dog that is to occupy it. In making it we must consider the comfort and health of the animal for whom it is to serve as a house and sleeping place. We assume that our kennel is to stand in the open air, in a corner of the garden, for instance. We must choose a corner where it will not be too much exposed in bad weather, and sheltered from the cold and biting winds.

The kennel itself must be made so that it stands a little way off the ground, to keep the floor dry in wet weather, for dogs take cold as well as human beings, and love warmth and comfort almost as much as we do. Also we must provide ventilation so that there is always a current of air through it. Then our dog's bed must be of a nature to make him comfortable. A little clean straw on the floor will do, and is all that is needed.



THE FRAMEWORK OF THE KENNEL

The length of the kennel inside should be half as long again as the dog when he stretches himself out, and the width wide enough to allow him to turn round without any difficulty.

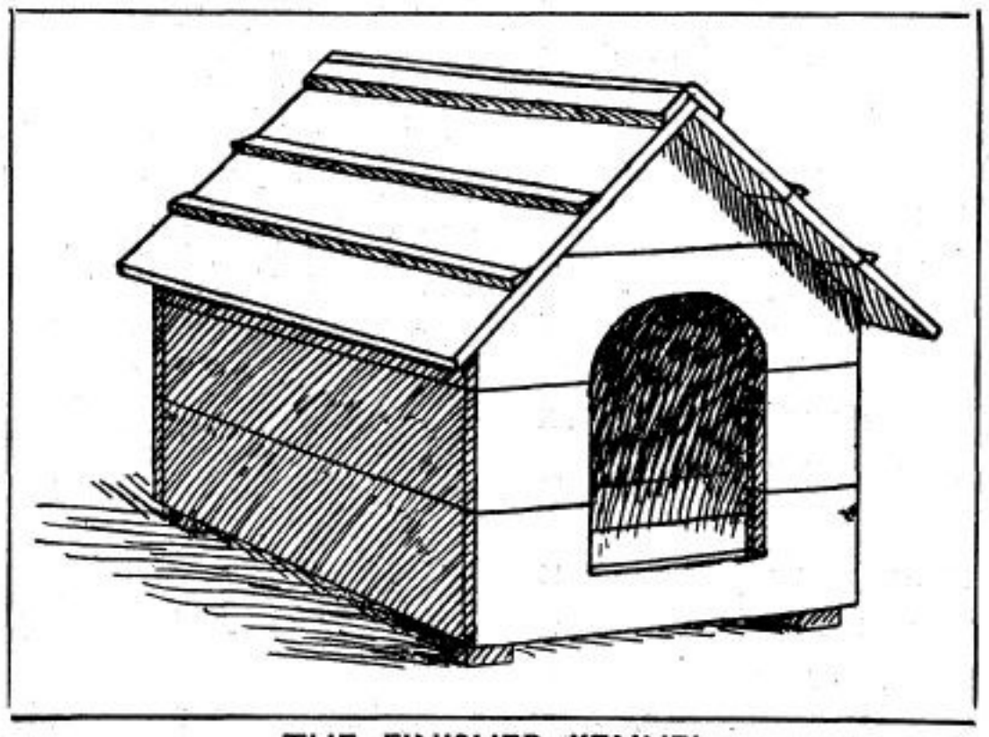
The first thing that we make is the frame of our kennel, which is shown in picture 1. The wood used should be two inches square. This is quite strong enough if we join it properly where the pieces meet. The picture shows clearly how the wood is checked at the corners. Care should be taken to make the joins fit well, because upon this the strength and durability of our work depend.

When we have made the frame we may begin to make the floor and walls. The floor-boards should be thick—not less than three-quarters of an inch—for thickness means warmth. They are laid across from side to side on top of—not under—the long frame-pieces seen in the top picture, and nailed into position with good strong nails. Now we can put on the sides, made of wood running from front to back, as seen in picture 2. This wood should be not less than half an inch thick. It is important to have the edges of these boards smooth and straight, so that we can put the pieces tightly against each other without leaving a long crack through which a draught can come into the kennel and harm the dog.

The front and back must next be made and fitted. We make the back boards similar to those with which we made the sides, and nail them across. At the top we must saw the ends off so as to slope to the shape of the frame that forms the end of the roof.

We must see that the boards are fitted tightly to each other, so as to leave no space for draught. Now we are ready for the front. It is made exactly the same as the back, except that we must leave an opening with an arched top to form the doorway. The two extra upright pieces in front of the the kennel hold the short front boards at each side of the doorway. We can make the top of the doorway arch-shaped by first marking the rounded shape with a pencil, or by cutting out a paper pattern; and then cutting round the marks with a key-hole saw, if we have one, and, if not, we can use our chisel to do the work.

We still have the two sloping roof-sides to put on. The boards for the roof should be fairly heavy, and they should project about three inches over the front and back, and about two inches over each side, as seen in the lower picture. This prevents the rain from running down from the roof on to the sides of the kennel. Finally, we put slips of wood, cut to the shape seen in the lower picture, over each seam in the roof to prevent the rain from finding its way into the kennel. The construction part of the kennel is finished; but we should bore five or six holes through the side walls under the projecting roofs, so as to provide the ventilation which is so necessary for the dog.



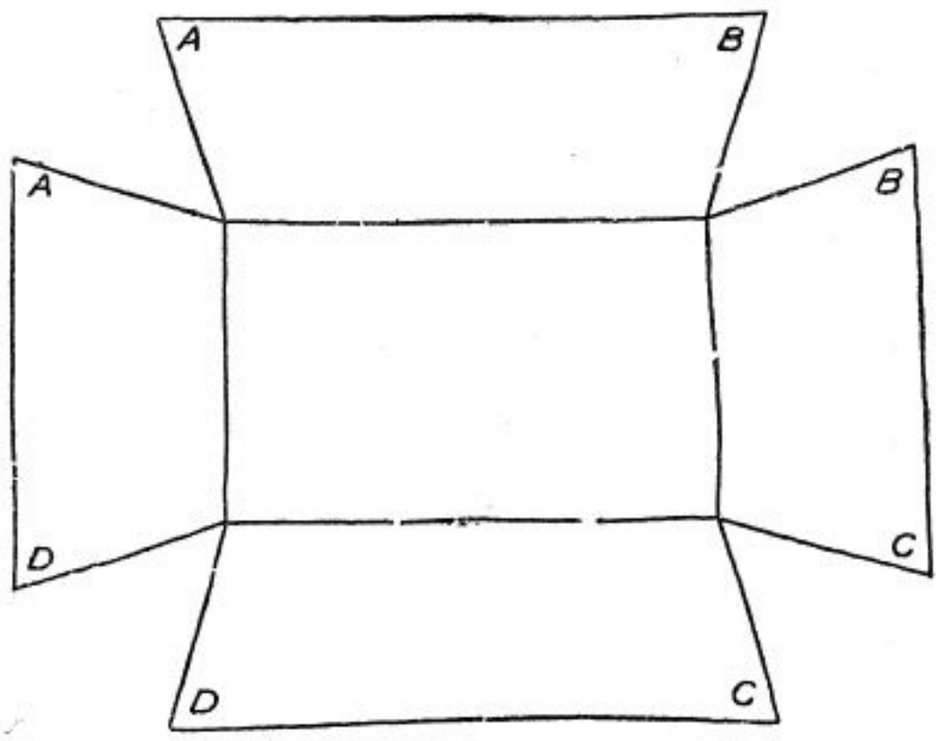
THE FINISHED KENNEL

We may paint the outside of the kennel with two coats of paint, waiting until the first coat is dry before applying the second, and giving the inside a coat of lime-wash.

HOW TO MAKE A GIRL'S WORKBOX

HAVE you ever thought of the joy it brings to have a real workbox of your own? Let us try to learn to make a box like the one in picture 2.

Take a piece of cardboard thick enough to make a firm foundation, and on this trace the lines in picture 1. Cut the cardboard all round the outlines. Bend the four pieces intended to form the sides. Do this while



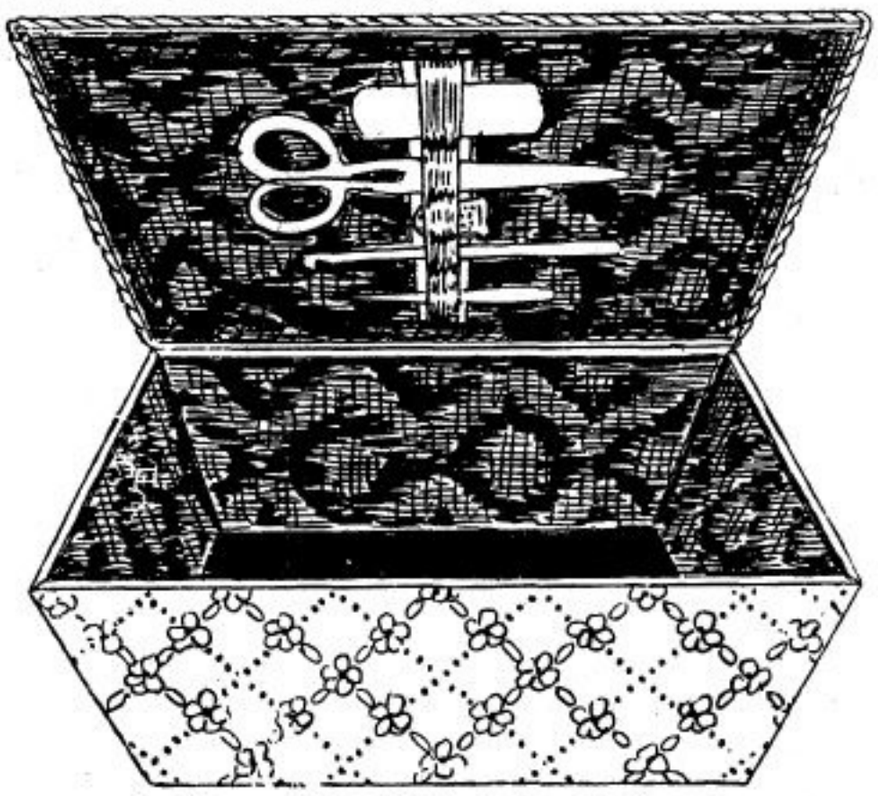
1. The pattern of the workbox

following the lines carefully, so that the bottom of the box will be quite even. Straighten the cardboard again, and cut two pieces of cretonne, each covering entirely the piece of cardboard which includes the bottom and sides of the workbox. Cut the material about a quarter of an inch bigger all round than the cardboard to allow for turning in the edges, which otherwise would fray and look untidy; then glue the cretonne on the cardboard, back and front. When this is done let it dry for one day.

The next thing to do is to bend the covered cardboard as before. This will be easy now, for, though the lines are hidden, the cardboard will bend naturally and without any difficulty in the same place. Join the corners A together by sewing the cretonne on the two sides with over-and-over stitches, using a needle with strong thread to secure the corners, top and bottom, very firmly. The same thing must be repeated in the corners marked B, C, D.

The workbox now stands and is covered and lined. Some cord sewn round the foot of the box will make a neat finish and slightly raise the box.

Now the cover must be made, and this is the most interesting part of the work. Cut a piece of cardboard to fit exactly the top of the box; then, before putting on the cretonne, put a layer of cotton-wool to form padding, and cover it with the material. Do this on both sides of the cardboard, taking great care to turn the edges in, as described for the other part of the box, before gluing the cretonne down. A strip of material is fixed on the inside of the lid, and sewn at regular intervals, to receive a thimble, a pair of scissors, crochet needle, and other things. The cover is then put on the box part by slipping two small pieces of cretonne under both cover and back of box, one on each side, to form hinges. These are then sewn very firmly, so that the lid can be opened and closed without getting torn or unstitched.



2. The workbox lined and ready for use

A silk cord running all round the top will hide the joining of the cretonne, back and front, and can be sewn with light, long stitches, tacking the cretonne on both sides, and making the edge firm and neat.

THE MYSTERIOUS BOTTLE OF WATER

A VERY amusing trick can be played upon a friend with the simple means of an ordinary glass bottle of any size or shape. For preference the bottle should be black or dark green, and we get a few holes made in the bottom of the bottle with a glazier's diamond.

Then we place it in a large jug or pail of water, with the neck only above the surface. We now fill the bottle with water right up to the brim, and cork it very tightly with a sound cork, or if the bottle has a screw stopper we screw it tightly. Then we take the bottle out of the pail, dry the outside, and it is ready for use.

The trick is to give the bottle to a friend, and tell him that he will not be able to draw the cork or unscrew the stopper without spilling all the water from the bottle. Of course he declares he can do the task asked, and proceeds to uncork the bottle. But as soon as he does so the air gets in at the top, and the water flows freely through the holes at the bottom, greatly to our friend's surprise. When the bottle was quite full and tightly corked, the pressure of the air outside the holes, without any corresponding pressure inside the bottle, kept the water in, but the removal of the cork causes the air to press upon the top of the water, and it flows out.

FORFEITS AND HOW TO PAY THEM

A FORFEIT is some curious and amusing task that has to be performed by a player who has failed to do what was required of him in some game. It may be that he has been unable to answer a question, or failed to find the object hidden in a game of Hunt the Thimble. Forfeits may be demanded in almost any game that we play, and at an evening party these games would lose a great deal of their interest if there were no forfeits at the end. The redeeming of the forfeits is often the greatest fun of a children's party. The difficulty is to think of a sufficient number of forfeits, so that all the players may have something different to do. The following suggestions may help us to fill up a gap.

FORFEITS THAT ARE DIFFICULT

Some forfeits are tasks that sound quite easy, but prove difficult when we actually have to perform them. One of these is to lie at full length on the floor with our arms folded and then to rise, keeping our arms tightly folded all the time. Another is to pay a compliment to five friends in the room, and not to use any word in which occurs the letter A in speaking to the first, or the letter E to the second, or I to the third, or O to the fourth, or U to the fifth. A third difficult forfeit is to go round the room and give to everyone present a piece of good advice.

FORFEITS THAT ARE TRICKS

But most forfeits are the opposite of those given above; they are tasks that sound impossible but are really easily performed. Here is a list of interesting ones that cause much amusement if carried out, but perplex the victim if he does not know how to do them.

To bite an inch from the poker. This is, of course, performed by holding the poker so that the end is about an inch from the mouth, and to imitate the act of biting.

To put yourself through the keyhole. We write the word "yourself" on a slip of paper, fold it up into small compass, and pass it through the keyhole. There are other forfeits of a similar character which are performed in a similar way, such, for instance, as to sit upon the fire. The words "the fire" are written on paper.

To put one hand where the other cannot touch it. This is easily performed by holding the left elbow with the right hand.

To ask a question that can be answered only in the affirmative. We simply ask someone to say what word the letters y—e—s spell.

To go out of the room with two legs, and to come back with six. This is done by walking out and returning with a chair.

To put three chairs in a row, take off our boots, and jump over them. We put the chairs in a row, then, taking off our boots, jump over *them*—the boots—not the chairs.

To place some small object, like a book, upon the floor in such a way that none present can jump over it. We do this easily enough by putting the book close up against the wall of the room.

FORFEITS THAT CAUSE GREAT FUN

There are some forfeits that cause great fun because the task set is impossible to perform without the player getting into difficulties, or being able to escape from saying something foolish about himself. There are several forfeits of this character. Here are four of them:

1. That was I. The player has to go all round, asking each person present what he has seen lately, and to every answer he must answer "That was I." Of course, the objects that are mentioned are such as a donkey, a baby, a dunce; and when the victim replies "That was I," there is great laughter.

2. To act the statue. In this forfeit the victim has to remain perfectly passive while one player after another puts him into some ridiculous position, and at each change he has to remain still till permission is given to move. Of course, someone will make him stand on one leg, among other amusing positions.

3. To act as a dummy. This is something like being a statue. The player has to remain perfectly silent, and to do whatever he is commanded by the different members of the company in turn.

4. To laugh in one corner of the room, to weep in another, to sing in another, and to dance in another.

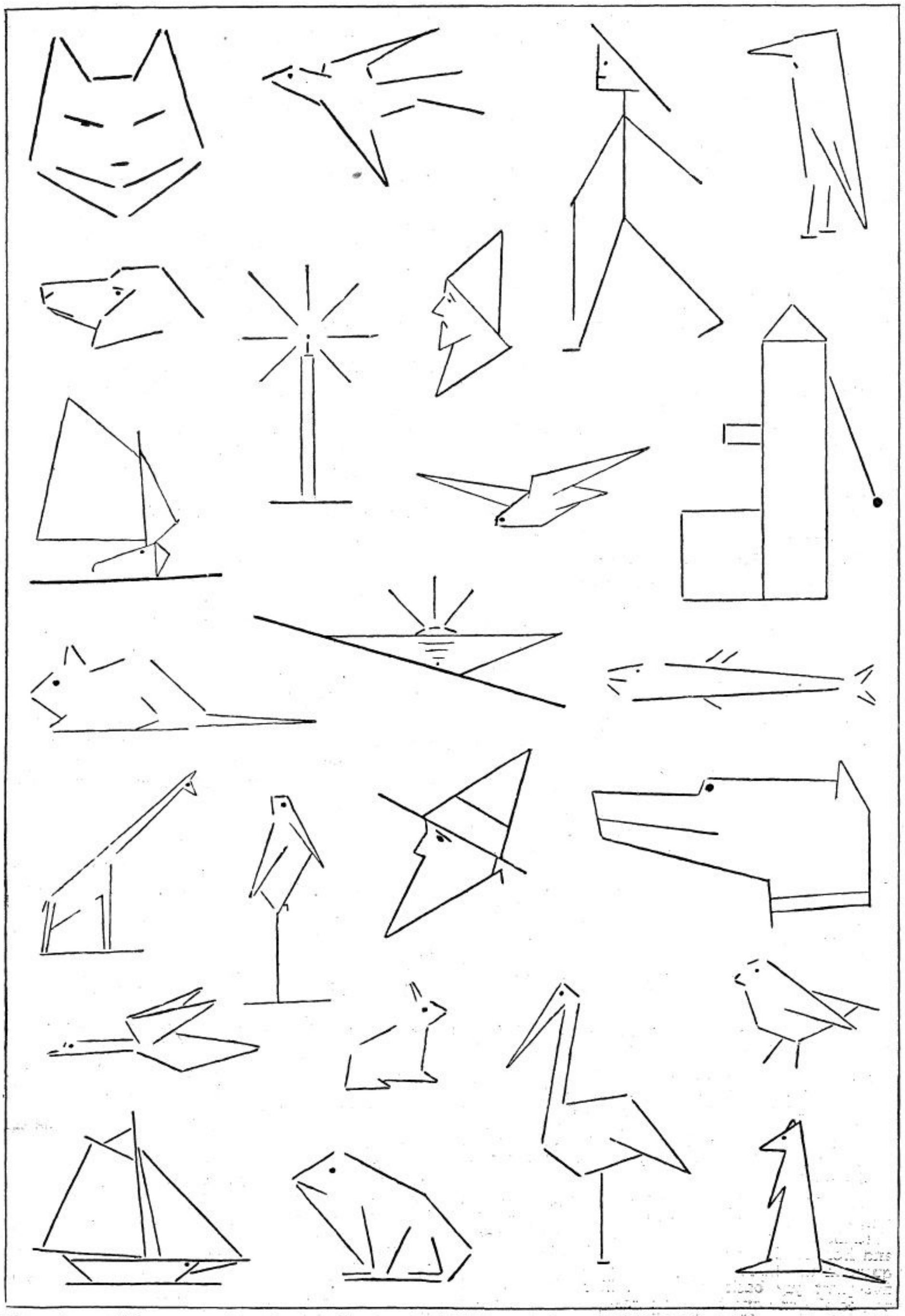
FORFEITS THAT NEED SKILL

Another class of forfeits needs real skill and tact and quick thought to carry out successfully. Two may be given.

1. To make a sentence according to the letters given. Each member of the company in turn mentions a letter of the alphabet to the payer of the forfeit, and he then has to speak a sentence in which the words shall begin with the letters that were given to him, and in the order given. Thus, if the letters were n, d, y, t, t, i, v, f, a, i, o, y, o, the sentence might be "No doubt you think this is very funny, and I'm of your opinion."

2. To use three articles named. In this forfeit the names of three articles are given to us, and, without a moment's hesitation, we have to say how we should use these for the benefit of some lady present. For example, the names might be chain, hand, cloak; and a suitable sentence would be: "I would fasten up with the chain any who tried to do her harm; I would give her my hand to help her into her car; and I would gladly lay my cloak in the road, so that she should not soil her shoes."

PICTURES MADE WITH 12 LINES AND A DOT



These clever pictures are all made up of twelve straight lines and one dot, neither more nor less. It is far more difficult to draw anything if we are confined to a few lines than if we can put in as many lines as we like. Let us see if we can make some drawings with twelve lines and a dot as good as these.

LITTLE PROBLEMS FOR CLEVER PEOPLE

THESE problems are continued from page 252, and below are answers to the problems appearing on that page.

20. When did Alfred Reach School?

Alfred had a fairly long walk to school every morning. When he got as far as the church he had walked one-quarter of the way, and it was usually half-past eight on the church clock when he passed it. When at the railway station he had walked one-third of the way, and it was twenty-five minutes to nine on the station clock when he passed.

At what time did he usually reach school?

21. When was the Watch Right?

At noon on Monday Herbert asked his father what o'clock it was. His father told him that it was noon, and said that his watch was two minutes fast. On Wednesday morning Herbert again asked the time, and his father replied that the exact time was eight o'clock, but added that his watch was one minute slow. Herbert then told his father at what time his watch had been exactly right. Could you have done it?

22. What Vehicles were Sent?

An order had been received at the garage for accommodation for a party of 59 children. The manager had big saloons to seat nine and some four-seaters, and he sent some of each, so that every one had a seat and there was no seat vacant. How did he do it?

23. The Hare and the Hound.

A hare was sixty of her own leaps in front of a greyhound, and took three leaps while the hound took two; but the hound went as far in three leaps as the hare did in seven. In how many leaps did the greyhound catch the hare?

24. How were the Sweets Divided?

"Pastries are 4d. each, chocolates a halfpenny, and caramels a farthing," said the assistant. "I have just twenty pence," said the customer, "please make me up twenty." How many of each did she get?

25. How did the Sheep Stand?

"I saw an odd sight the other day," said Brown. "Two sheep were standing in a field, one looking due north and the other due south. How do you think that each could see the other without turning round?"

Can you give the answer?

26. How Many Seats in the Hall?

"Is there a good audience?" asked the lecturer "Only one-third of the seats are filled," he was told; "but I think we should have filled the hall if the tickets had been 6d., including tax, instead of 1s., and in that case we should have taken five pounds more."

How many seats were there?

27. How Many Boys Were at School?

A schoolmaster divided £10 among the boys in his school. Ten were away ill and he kept their share back. Had he not done so the others would each have received a shilling more. How many remained at school?

28. How Long Did He Wait?

"You have missed the train by a minute," said the station-master, "but there is a train every few minutes." "If there were three more trains an hour," said the traveller, "and I had just lost a train by a minute, I should have a minute less to wait for the next." How long had he to wait?

29. How Fast is the Current?

Duncan rowed three-quarters of a mile up-stream in half an hour. If there had been no current he would have taken only a quarter of an hour. What is the speed of the current?

30. How was the Ferry Crossed?

Fred and Albert, with their father and the village postman, stood at the ferry, waiting to cross. Fred and Albert each weighed 8 stone, and their father and the postman each weighed 16 stone. But the boat could carry only 16 stone at once.

How did they all cross the ferry?

THE ANSWERS TO THE PROBLEMS ON PAGE 252

14. The clock would take sixty-six seconds to strike twelve. Between the first stroke and the sixth stroke there were five intervals of time, each interval being six seconds. Between the first and the twelfth stroke there were eleven intervals of time, each of six seconds, so that the clock would take sixty-six seconds to strike twelve.

15. He filled a three-quart jug from the milkman's can, and then poured it into the five-quart jug. He filled the three-quart jug again from the milkman's can, and from it filled up the five-quart jug, leaving one quart in the three-quart jug. Now he emptied the five-quart jug back into the milkman's can, and poured the one quart in the three-quart jug into the five-quart jug. Then, by filling up the three-quart jug from the milkman's can again, and adding it to the one quart in the five-quart jug, he had the four quarts required.

16. Four eggs. One hen would lay one egg in a day and a half—that is, two eggs in three days, or four eggs in six days.

17. The last boy took the basin as well as the egg that it contained.

18. As the tramp runs round the stack in forty seconds, and the farmer in thirty seconds, the farmer can run round four times in the same time that the tramp takes to run round three times. This means that in four rounds run by the farmer he would gain one round upon the tramp; but, as the tramp had a start of only half a round, the farmer would overtake him after running two rounds, which is the answer.

19. In another 3 years Tommy will be 6 years older than he was 3 years ago. If his age is then 3 times what it was 3 years ago, 6 years must be twice his age three years ago, so that he was 3 years old 3 years ago, and he is 6 years old now.

HOW TO KEEP A SECRET IN WRITING

It is a wise and safe rule that if you want to keep a secret, you must never write it down; but it is easy to write a secret so that nobody but yourself or your friend can read it.

Some years ago, when a terrible thing happened in Russia, the Russian Government did not want the news of it to reach other countries, and they stopped all telegrams about it. But a clever journalist knew how to beat the Government, and he sent long telegrams to a merchant in Liverpool all about corn. It seemed very uninteresting and unimportant to the telegraph clerks in Russia, but when the merchant received the telegrams in Liverpool he knew that the Emperor of Russia was dead. The journalist had written his telegrams in a mystery-language which he and the merchant understood.

You may make a mystery-language of your own. A cipher is a way of writing, in any language, in such a way that even those who know the language cannot understand the writing unless they have the key which makes it clear. There are many simple ciphers which we can quickly learn.

This sentence would puzzle some boys and girls if they saw it in a book: "Ihope-youcanreadthis," but it is really only six words joined together.

That is the simplest kind of cipher you can have, and not really a cipher at all. Here are some others, three letters written in different ciphers. The first looks like a Chinese puzzle, but the key will show you how easy it is.

Extraordinary as this seems, it is really very simple when you have the key to the cipher in which the letter is written. The alphabet is divided up so that it is possible to indicate the position of any one letter by a dot, as is seen here:

a	b	c	d	e	f	g	h	i
j	k	l	m	n	o	p	q	r
s	t	u	v	w	x	y	z	

You will notice that there are three letters of the alphabet in each space, except the last. To write the key, begin with the first letter in the first space, then write the alphabet *across* the rows of spaces. Next you must notice the position of each letter in each space; for instance, *a* is the *first* letter in the space marked by the lines ___| Thus instead of writing *a*, you write .___|, being careful to place the dot in the *first position* in the space. In the same way *b* is written _.__|, where the dot is in the *second position*. The letter *d* is the first dot in the second space, thus: |.___| *e* is |_.__| and so on for the remainder of the letters. Instead of using dots the figures 1, 2, 3 may mark positions, so that *a* would be 1___|, *b* 2___|, *c* 3___|, and so on; but the dot system is better and more puzzling. When writing a letter in this way remember to *put a full stop after each word* and *three stops at the end of each sentence*. Always take care that these stops come *outside* the space. Commas and stops may be used as usual.

Now that you have the key, you will be able to read the cipher letter, which says:

DEAR ELSIE,

I hope you can read this. Have you ever had a letter like it before? It is the first I have written in this way, but it does not seem very hard. When are you coming to see us? Father has bought me a beautiful pony, and I want you to ride him. With love from EVA.

Here is another cipher—a letter in figures:

13.2.1.43— 2.51.1—
45.23.2— 21.3.43.44.45— 41.1.43.45—
4.21— 54.4.5.43— 33.2.45.45.2.43—
45.4.4.32— 34.2— 1— 33.4.35.22—
45.3.34.2— 45.4— 43.2.1.13, 11.5.45—
3— 44.4.4.35— 11.2.22.1.35— 45.4—
32.35.4.52— 45.23.2— 33.2.45.45.2.43.44
52.3.45.23.4.5.45— 5.44.3.35.22—
45.23.2— 32.2.54... 3— 1.34—
12.4.34.3.35.22— 45.4— 44.2.2— 54.4.5-
3.35— 45.2.3.2— 23.4.33.3.13.1.54.44—
3.21— 3— 12.1.35...
52.3.45.23— 33.4.51.2— 21.43.4.34—
2.33.44.3.2.

To get the key of this cipher write out the alphabet in this way, numbering the five vowels in order :

a b c d e f g h i j k l m n o p q r s t u v w x y z
1 2 3 4 5

Thus, a is 1 ; e is 2 ; i is 3 ; o is 4 ; u is 5.

To find any other letter, we must get first the number of the vowel before it, then count the number of letters after the vowel until we reach the letter we want. Thus, *b* comes after the *first* vowel, and is the first letter after it ; and instead of *b* we write 11—the first figure for the number of the vowel, the second for the number of the letter past the vowel. In the same way, *c* is 12—that is, the second letter past the first vowel ; *f* is 21—that is, the first letter after the second vowel. We must be very careful, of course, to put the number of the vowel in its proper place.

We can now write the whole alphabet in figures according to our cipher :

a-1	e-2	i-3	m-34	q-42	u-5	x-53
b-11	f-21	j-31	n-35	r-43	v-51	y-54
c-12	g-22	k-32	o-4	s-44	w-52	z-55
d-13	h-23	l-33	p-41	t-45		

In writing this cipher, *put a full stop after each letter*, and *a short line at the end of each word*. Finish a sentence with three full stops ; use commas and other stops as usual. You will now be able to read the figure-letter in ordinary writing. Here it is :

DEAR EVA,

The first part of your letter took me a long time to read, but I soon began to know the letters without using the key. I am coming to see you in the holidays, if I can. With love from

ELSIE.

The third cipher may seem more puzzling still at first sight.

DEEEEAYARE EEELLESSEYEEE,

Doubleyouee aitchaydee essyousea-aitch effyouen ohveeeeare teaaitchee elleeteateaeeare wyohyou esseeentea. Jayayseakay teaaitcheyeenkayess wyohyouare seaeyepeaaitcheeare eyeess veeeearewy geeohohdee. Eye ayem jayyouesstea geeoheyeengee ohyoutea ohen emwy peaohenwy, essoh geeohohdee-bewyee.

Doubleyoueyeteaaitch ellohveeee
effareohem EEVEEAY

If you will read this letter aloud, the mystery will become clear to you. The secret of it is that every letter is *spelt*. Some letters of the alphabet can be spelt in more than one way, but it does not matter which we choose if we keep the same throughout our letter.

In ordinary writing the letter reads :

DEAR ELSIE,

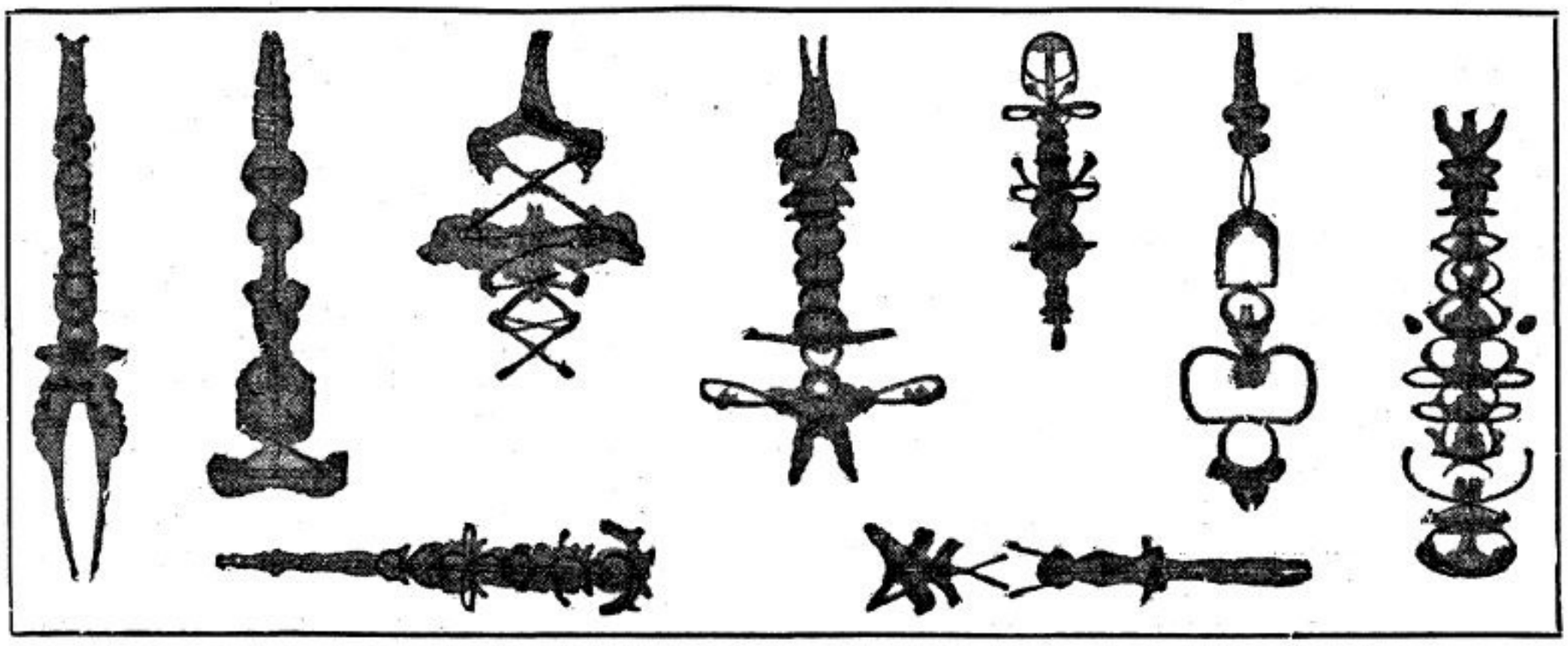
We had such fun over the letter you sent. Jack thinks your cipher is very good. I am just going out on my pony, so good-bye. With love from

EVA.

These examples of mystery-writing will give you great amusement if you practise them, and you will find that to invent new ciphers for yourself is very simple now that you have learned to understand these.

NAME PICTURES AND HOW TO MAKE THEM

MAKING name-pictures, or smudge-graphs, is a very pretty amusement. We want paper, pens, and ink, and must sit up to the table. Dip the pen in the ink and scribble quickly a fairly thick zig-zag line on the paper ; then, before it gets dry, fold the paper over at the side of the scribbled line and rub it down with the thumb-nail. On opening it again a pretty outline will be seen. Names or words may be written instead, and the paper folded at the base of the letters. Fold the paper *first* and use the fold to write against, as you use the lines in exercise books.



Pictures made by folding over smudges, zig-zag lines and crosses.

Simple Learning Made Easy for Very Little People

READING—LEARNING TO READ WORDS

NEXT day, when Mother came in, she found the twins busily poring over their big " A for Apple " picture book.

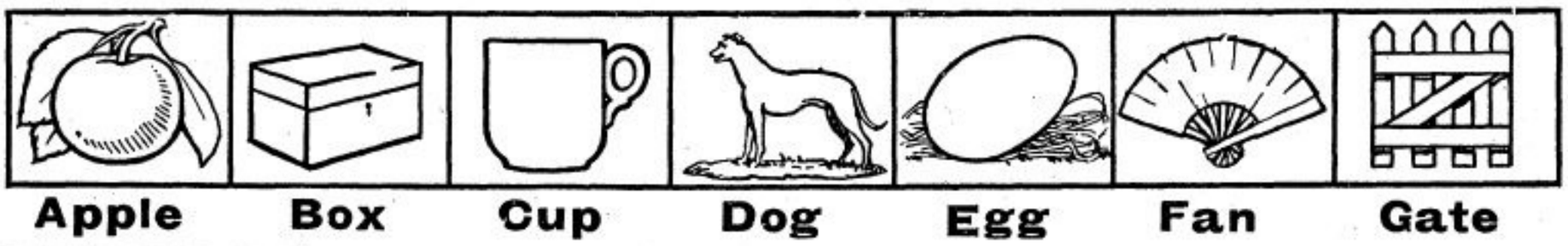
They didn't look very happy.

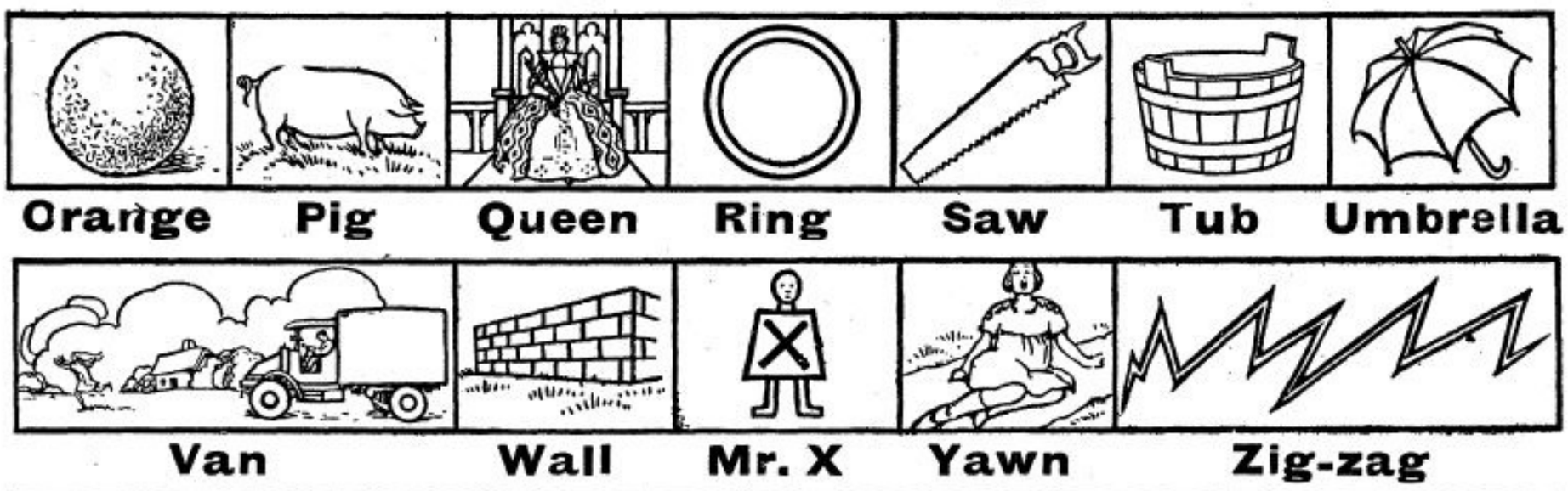
We can't pick out all the reading in our book, the letters are mixed up so, said Billy.

Ah, you wait and see what I have for you now ! said Mother. I must tell you that A for Apple is not enough. We have to name all those other letters. See, it takes five of our letters to write down a p p l e, and all those letters put together make a little word.

Here is a real apple which you can eat for your lunch (it was a fine big rosy-cheeked one that Mother held out), and here is a picture of an apple, and here is the *word* a p p l e under it.

Now the best thing is to learn some little words with the pictures first, then the picture will tell you what the word is. In these little boxes there are a lot of wooden blocks, and there is one picture and its word for every letter you have learned. You can place them out in the same rows as before, and then you can match them up.





Daddy has put a capital letter to all these words, so that you can put them more easily in the A B C order, and words do have a capital when they stand by themselves.

The twins played all the morning with their little picture blocks, mixing them up and putting them in rows ; and when Daddy came home he copied all those little words on little cards so that they could put the card words under the picture and word.

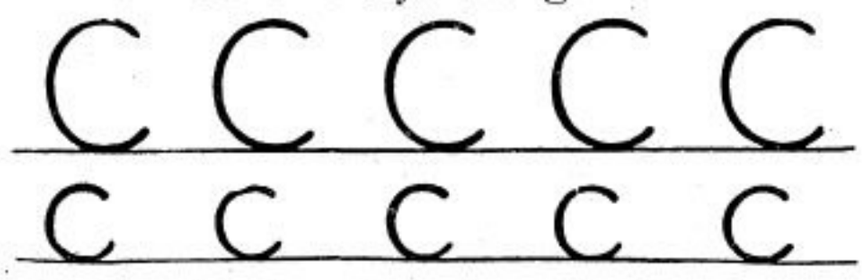
They liked this, and by and by Billy said : Let us see if we know our words without the picture.

So they turned the little picture blocks over on their backs, and laid all Daddy's words in rows, and of course they did them all right, because the first letter in every word was one of their old A B C friends.

WRITING—BIG ROUND O

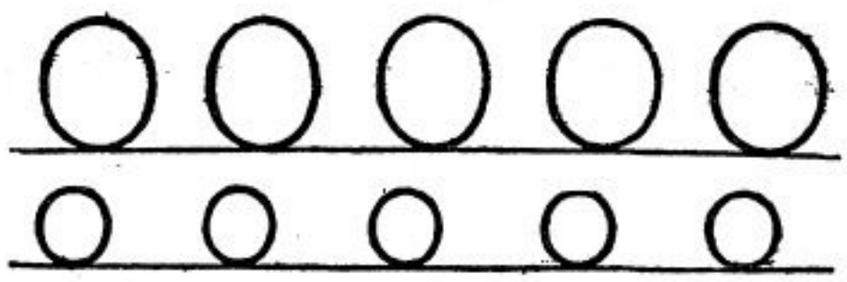
Now, said Mother, I know you are both wondering why we haven't yet done that nice big round O you both like so much ; but, though it looks so easy, it is only easy to make the wrong way. So we will first learn to make capital and small C.

A little dot we first will make,
Then to the *left* we go.



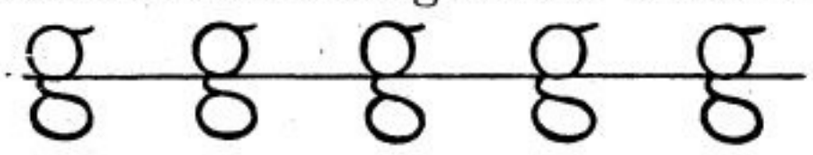
C for Carlo and Auntie Carrie,
c for car and c for carry.

Round to the left and up we go
So we make the letter O.



Give a little stick to C,
So we make a capital G.

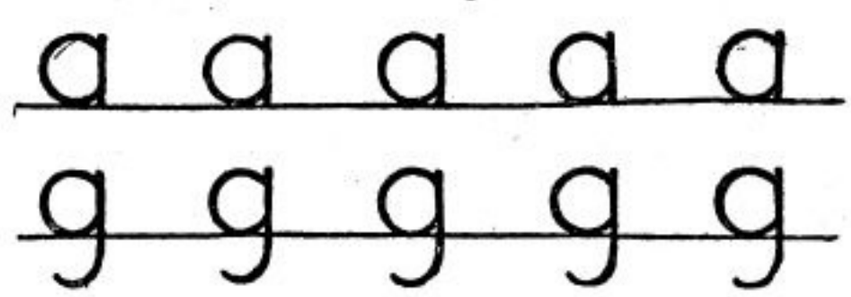
Little g is hard to write,
Watch me first, then off you go.
Like small o with a feather in his cap,
And a tail curling round below.



G for Goosey, Goosey Gander,
g for the goose with her golden egg.

The twins could not make a and g nicely. Just see how crooked they are in the books, they said, but ours are more crooked still.

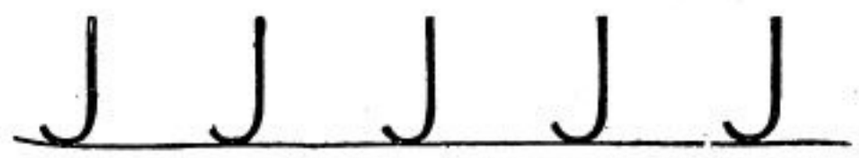
Never mind, said Mother, people sometimes find easier ways to write them, and here they are :



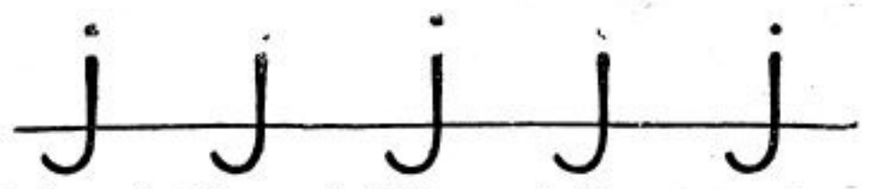
Oh, those are quite easy, said the twins, we will always make ours that way.

Now we will make four more letters, said Mother.

Down to the bottom, turn to the left,
So we make a capital J.



Lower down, with a dot on top,
So we make the little j.

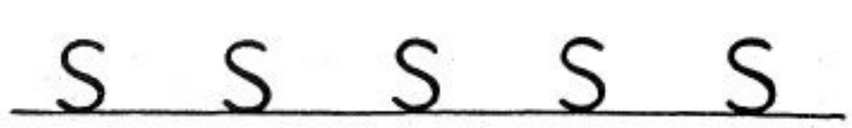


J for Jack and Jill and Jenny,
j for jar and jam and jelly.

Letter S we next will make,
Curly, like a little snake.

Capital S for Simple Simon,
Saturdays and Sundays.

Little s for six or seven
And the sun we see on sunny days.



Give round O a little tail,
So we make a capital Q.

Give small o a stick to hold,
So we make a little q.

COUNTING—A TALK ABOUT THREE

TODAY let us talk about three, said Mother next morning. You know a lot about 3 already, don't you? Tell me any little song you remember with 3 in it.

So the twins sang: Three Blind Mice, and then these other rhymes:

Rub-a-dub-dub
Three men in a tub.

Three wise men of Gotham
Went to sea in a bowl.
If the bowl had been stronger
My song had been longer.

Then they sang about

Baa, baa, black sheep, have you any wool?
Yes, sir, yes, sir. Three bags full;
One for the master and one for his dame,
And one for the little boy who lives down the lane.

After that Mother brought out two little boxes, and in them were such pretty beads of two colours and two long, fine, leather bootlaces.

Now, said Mother, you can make bead chains. In each box there are some little tickets, and they have 1 dot, or 2 dots, or 3 dots on each, and you can take one ticket and pick up as many beads of the two colours as are on your ticket.

The twins made a lot of chains, and it kept them very quiet for quite a long time. Then they took their boards and chalk and drew the story of the Three Bears, and the three bowls and chairs and beds.

And just before Daddy came home Mummy asked them some little questions like this:

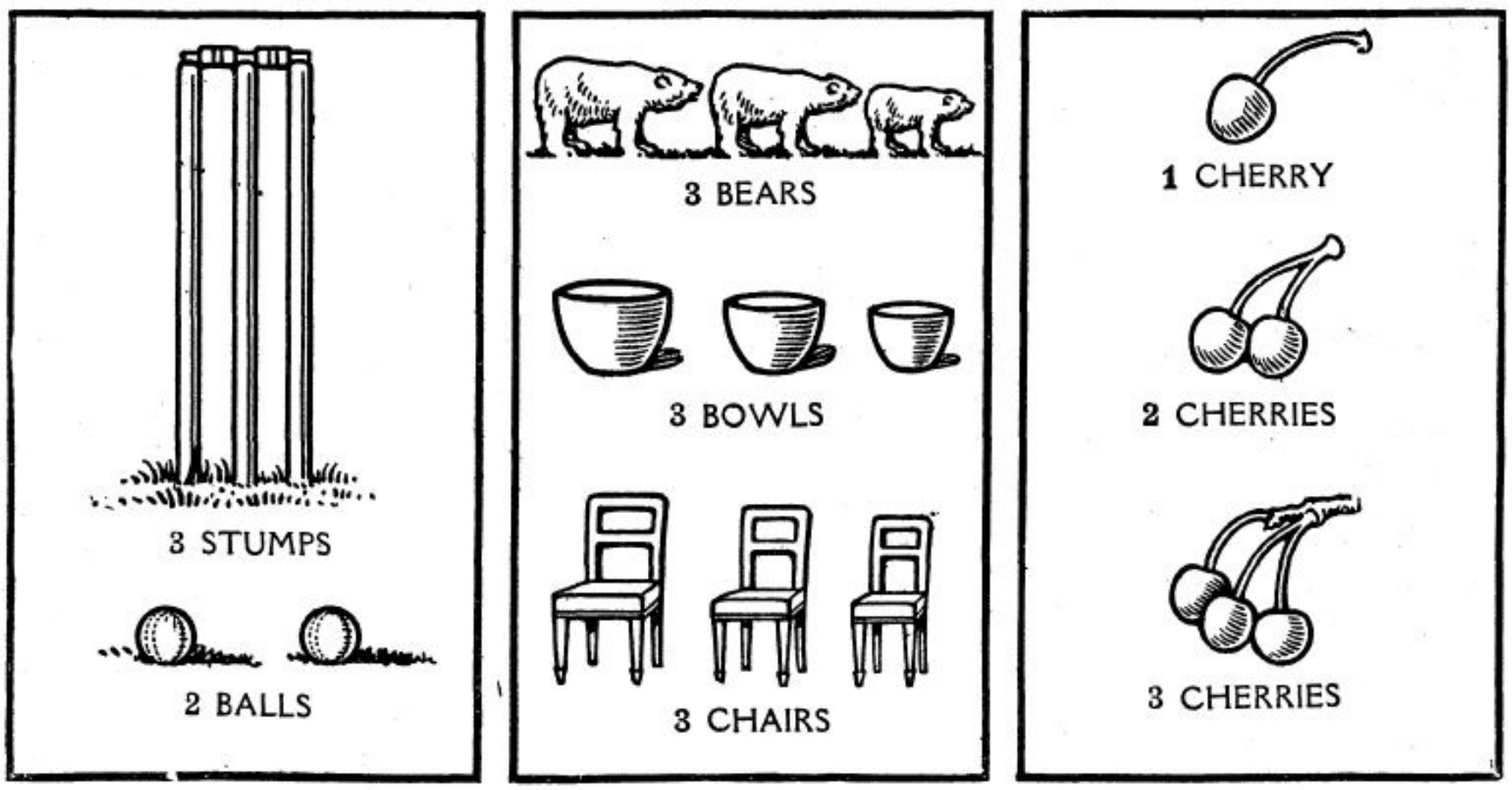
Two twins and 1 mother, how many people?

Which is most, 3, or 2 and 1?

A drum for Billy, a doll each for Betty and Baby. How many toys?

Three large apples. Billy ate 3. How many left?

Then they took their boards and chalk and drew little number pictures, with 1, 2, and 3 things in.



MUSIC—THE ROAD THE FAIRIES TRAVEL ON

IN the days of long ago the fairies had much to sing about—beautiful stories for the men and women, boys and girls, who live in this bright, happy world.

When a fairy has told someone of her beautiful secrets she likes it to be told again and again, because the fairies wish us to make one another happy; and if they told you and me a lovely story they would expect us to take that story to someone else.

Now, it is one thing to hear a tale, and quite another thing to be able to tell other people about it.

First of all, we are living in quite a big world which contains many countries, and each country has a great many people in it, speaking different languages, and it would be quite impossible for a little boy or girl, or even for a grown-up person, to whisper the fairies' secret in everyone's ear.

The Treble Road

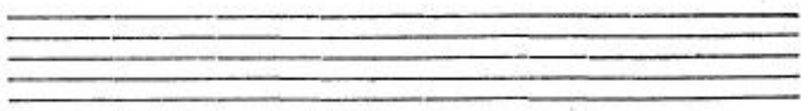
Happily for us, long, long years ago a great discovery was made; the Fairy Map was found, and everybody set to work to understand it. That is what you and I are going to do, because we want to know all the beautiful stories the fairies have told, as well as the many new tales which they may have in store for us.

We will begin by taking another look at our Magic Kingdom—the piano—and we will go at once to Fairy C's house, which is in the middle of the long black and white line.

We shall find she is at home, waiting for us, because she has something very important to tell. She says that this house of hers is the meeting-point of two roads. That part of the black and white line on her left-hand side is called the *Bass Road*, and the part of the black and white line on her right-hand side bears the name *Treble Road*. We must try to remember these names, because when we want to know what the fairies have said, they let us know which of these two roads we are to find, and which house in that particular road we are to visit.

The Bass Road

First they draw five straight lines, just like this:



These are the fairy motor-lines for the fairy motor-cars, and both fairies and goblins have a very special name for them. They call them *a stave*, and each road has its own stave. The fairies know we might easily lose our way, so as they are kind little people they have sent us two small guides; one is a little fairy girl and the other a little fairy boy. The fairy girl is Fairy G's godchild, and the fairy boy has Fairy F for a godmother. Fairy G's little goddaughter carries a banner of curious design, just like this:

and Fairy F has given her godson a banner with this strange device:

Directly the little guides are called they come and take up their positions at the entrance to their own stave, so that they may show us the way. Fairy G calls her little helper *Treble Clef*, and she has to stand at the entrance of the road which bears her name. Look at the picture above.

Fairy F's little helper is called *Bass Clef*, and he is on duty in the road which is named after him. There is a picture of him on this page.

Today we just want to amuse ourselves with the fairy motor-lines, and I think we shall like drawing them.

We must also remember the two roads in our Fairy Kingdom.

First, the road running to the right of Fairy C's central house, called *the Treble*, because little Treble Clef stands at the entrance to guide us. Second, the road which lies to the left of Fairy C's central house, and is called *the Bass*, because little Bass Clef is waiting patiently at the entrance.

Next time we are going to find out where each fairy stops her motor-car.

DRAWING—PICTURES OF LEAVES AND TWIGS

HAVE you ever noticed that the trees begin to alter and look spring-like in the early days of the year, long before the green leaves come? Every little twig bears a bud that grows bigger every day, and the twigs and buds on each kind of tree are quite different from one another. We should be able to draw these twigs and buds so well that people will see at once whether we are drawing an oak twig, or a chestnut twig, or whatever twig we happen to have chosen.

Can you get some from different trees and try? If you cannot manage to find any twigs, perhaps you can get some flowers and leaves—snowdrops and ivy leaves. We will learn how to draw each of these things, beginning with the twigs.

Have your paint-box and brushes ready, quite clean, and a jar of clean water. Pin a sheet of brown paper on your board, and have a sheet of white paper near, as you will want it afterwards. To begin with, we shall want black and white chalk and two pencils, one with a fine point and one sharpened flat, like the edge of a chisel.

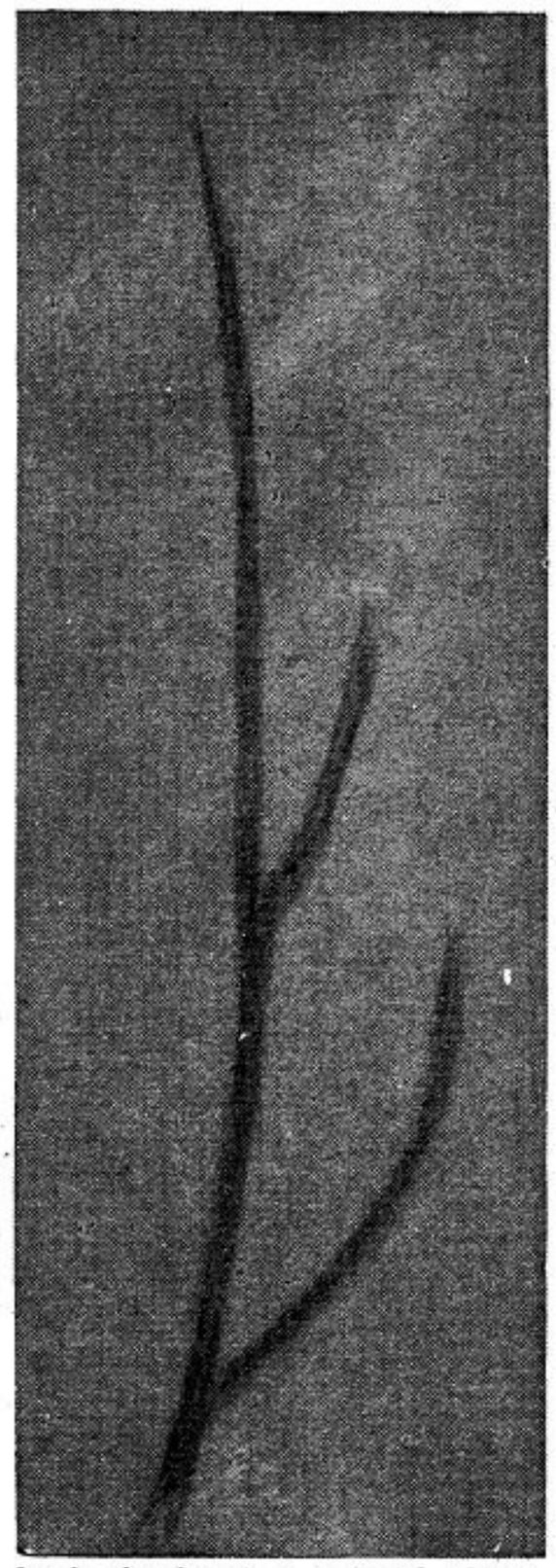
If you do not know the name of the tree from which you have taken your twig ask someone to tell you. Now put the twig beside you on the table, on the *left-hand* side of your board, and if you can sit with the light coming from a window on the left-hand side too, it will be much better for you than having the light come from the front or from the right-hand side.

Take a good look at the twig; notice how it curves or turns, first to one side, then to the other. Take your black chalk and draw the longest piece first. It is thickest at the end where it was broken off from the tree. Draw the twigs branching from it next—if there are any—and then the buds.

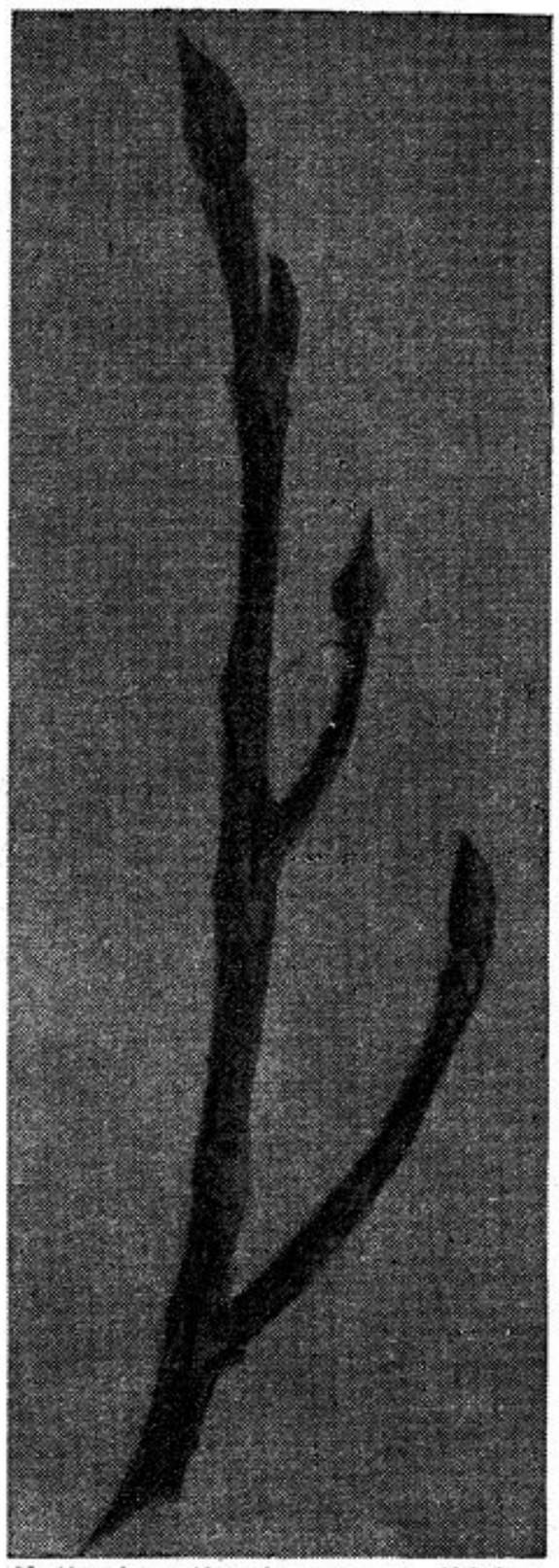
One thing is very important, and we must show it on our drawing. It is this: the stem grows thicker wherever a smaller branch or bud starts from it. This is because the food on which the buds feed all the winter is stored there. Without that little storehouse they could not grow, so be careful to thicken your twigs in the proper places.

If you find it very difficult to get all the little branches right at first you may put the twig on the paper and mark, with a little dot, the place where each one comes. But we should not do this often; it is rather a baby way. I hope the drawing is large enough. Measure it and see by putting the twig you have copied on the top of your drawing. Do it again if it is too small, for it is a very bad fault to draw things too small. Now get the white paper and mix some colours to match the shade of the stem; the buds want a different colour.

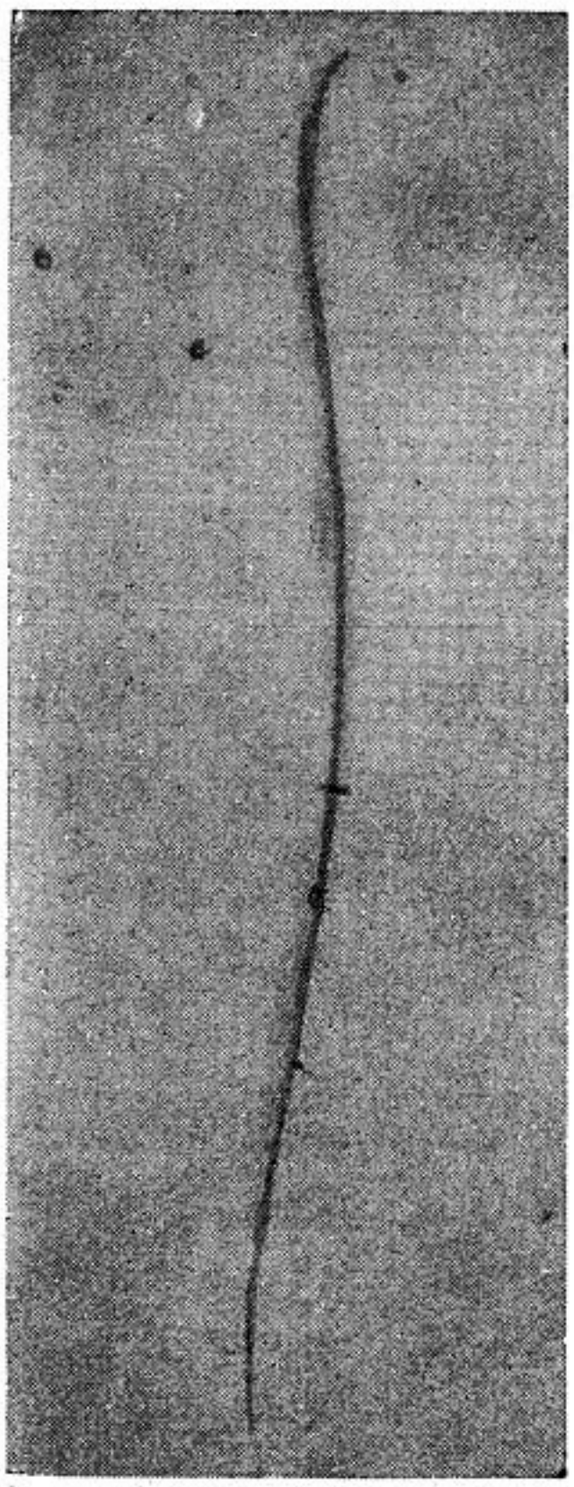
If the stem is grey, mix together light red, cobalt blue, and yellow ochre. A bluish grey will want most blue paint; a greenish grey will only want a little red. Do not put out too much colour if you have tube paints, as you will only want a little.



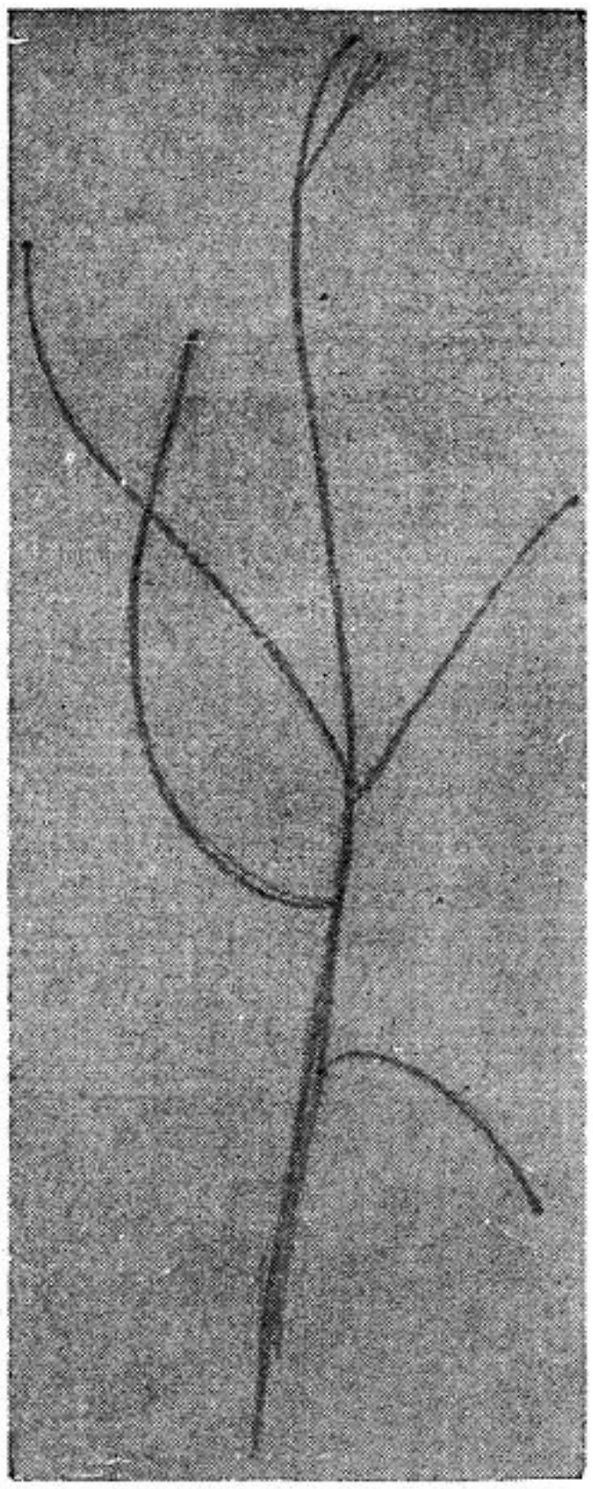
Look closely at a twig of a tree, and draw on brown paper, with black chalk, first the stem and then the little pieces branching off from it



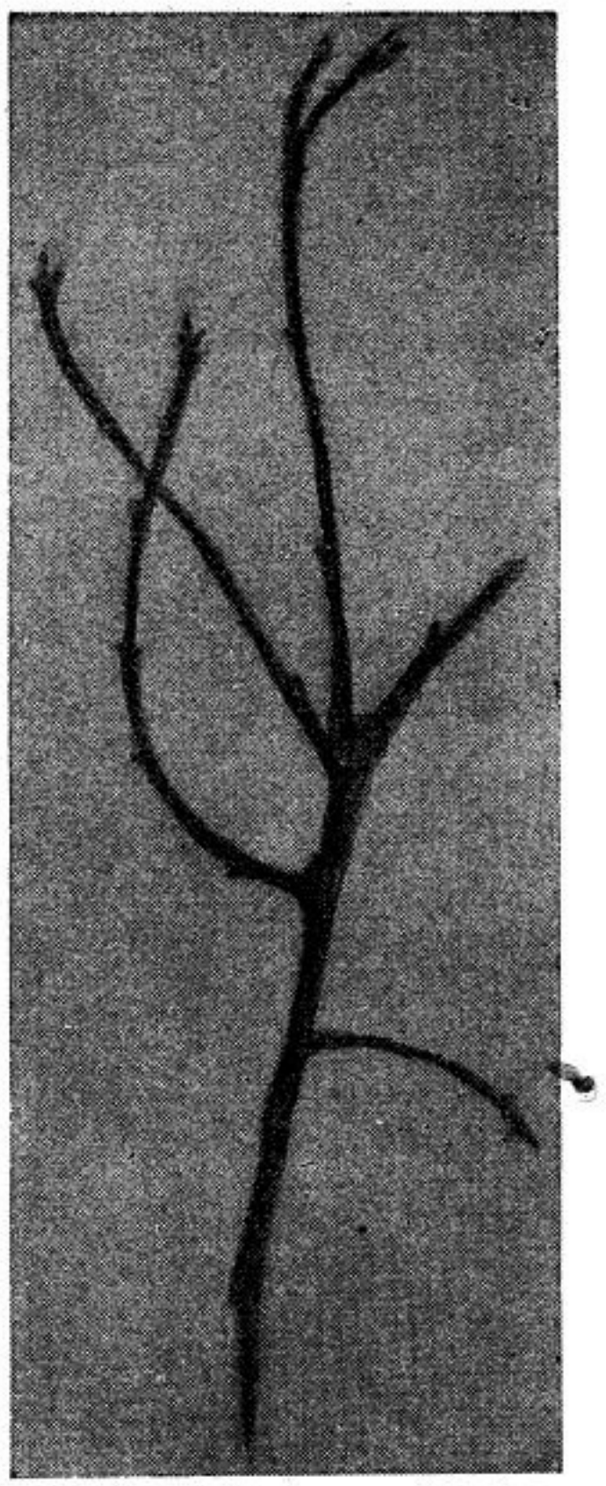
Notice how the stem grows thicker wherever a branch starts from it, and show this in the drawing by thickening the line in these places



If you find it difficult to get the branches in the right places, put little marks where they should begin and end, before you start to draw.



Draw the little branches, beginning at the stem and ending at the point where the bud is. Now we are ready for our white paper and paints.

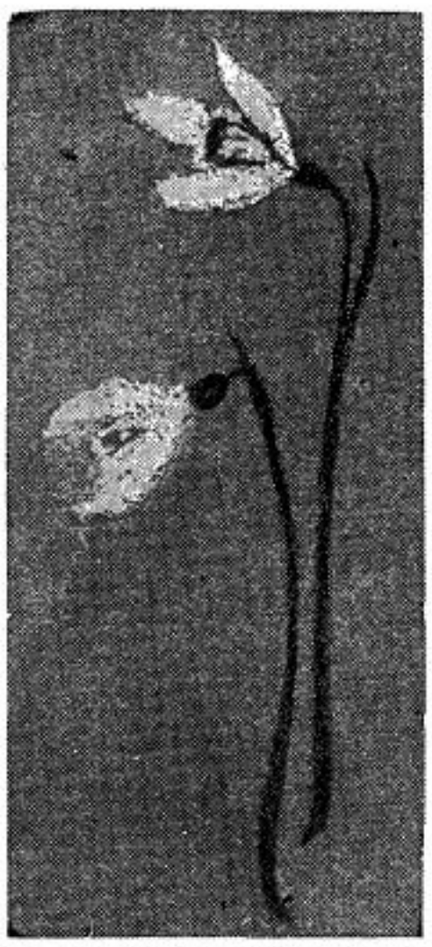


Paint the twig at once this time, without any outline. Make the stem brown and then paint in the buds remembering to paint downward.

If the stem is brown use sepia or Vandyke brown. Try your paints carefully till you get the exact shade, and after you have painted the stalk you must get the exact colour of the buds and put them in.

Paint straight away with the brush, holding it rather upright, but do not make a pencil outline first. Always paint downward, not upward. If you have snowdrops instead of twigs, use white chalk on brown paper for the flowers and black chalk for the stalks. If you want to draw leaves, put in the shapes in black chalk.

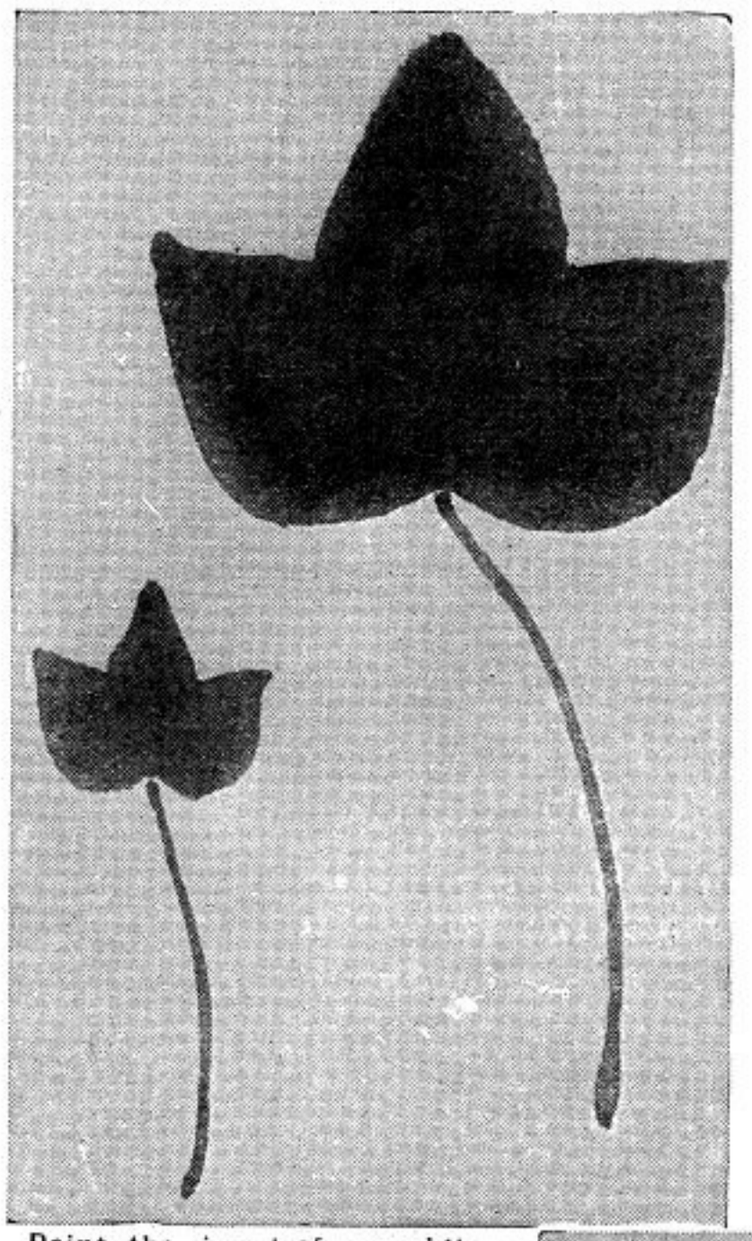
The snowdrops must be painted with Chinese white on brown paper. Paint flower and stalk in white first; then, when the paint is dry, paint the stalk green over the white. Lemon yellow and cobalt blue, with a very little light red, make a good green. The ivy leaf must be painted in green on white paper. No outline must be made first. Ivy leaves are sometimes dark and sometimes bright green.



In drawing snowdrops use white chalk for the flowers and black for the stalks. Paint the flower and stalks in Chinese white, and then paint in the stalk green.

Use Prussian blue, gamboge, and a little light red for bright green. Put Vandyke brown with the blue and gamboge, instead of red, for dark green. Let the paper be damp—not too wet—see that it slants a little, and paint downward. Do not try to shade the leaves; put the colour on quite flat and smooth.

When you have done this you can, if you like, practise your pencil work by drawing a cobweb like the one you see in the picture. If you have drawn twigs you can make it



Paint the ivy leaf on white paper with green paint. Make the paper damp and paint downward, putting on the colour quite flat and smooth.

if you cannot manage this, try again, making a new line altogether. It is a very bad plan to think it doesn't matter to draw a line carelessly because it is so easy to rub it out. This is really a waste of time, for not only is the paper spoiled but the eye loses its power of judging what is a good line.

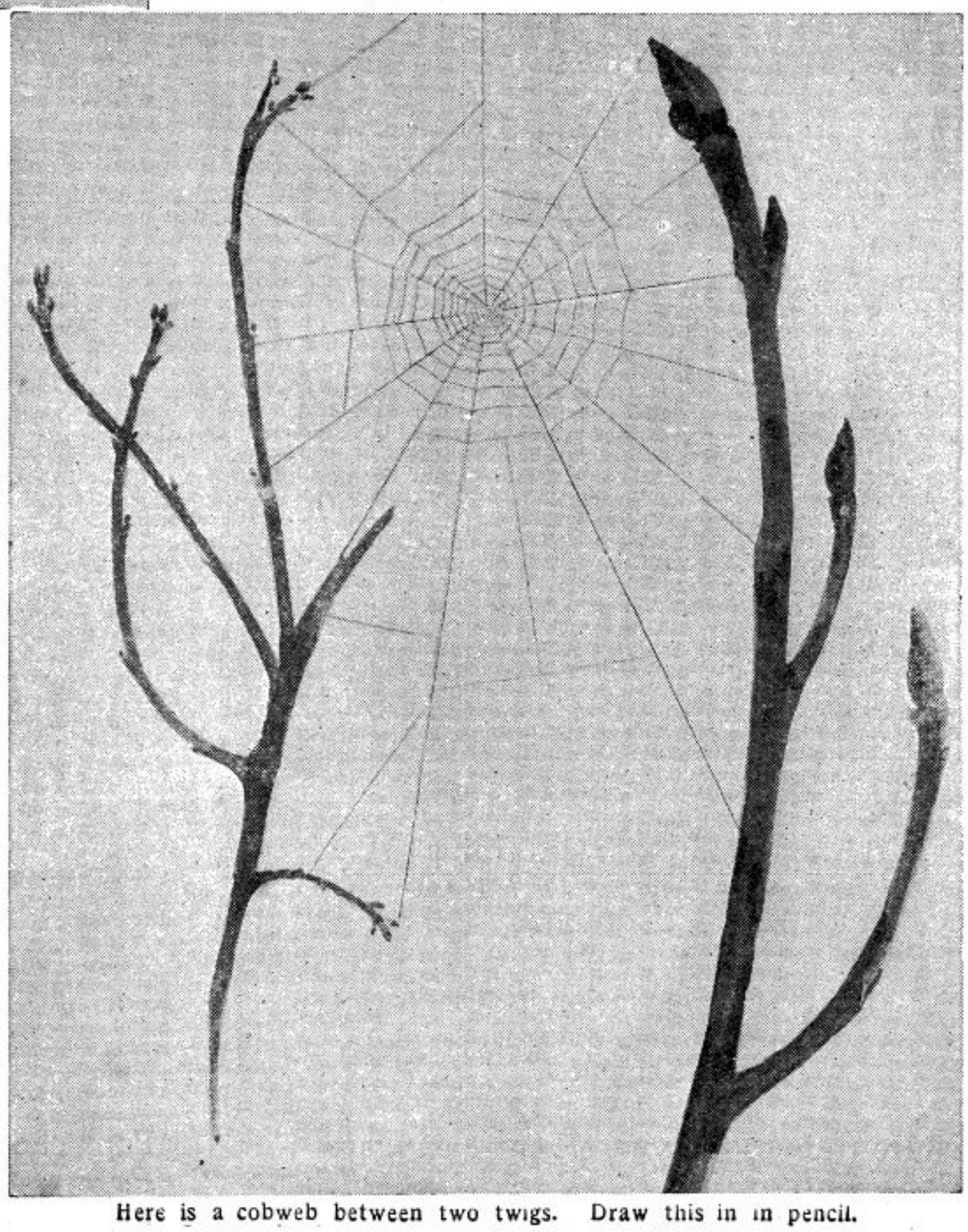
As soon as we have mastered the secret of drawing leaves and twigs correctly we shall find it easy to make some very pretty pictures. In the autumn the earth is carpeted with lovely colours, and these are nearly all due to the leaves which have fallen from the trees.

Some are pure yellow, some crimson red. Take a handful of them home and lay them on the table as you saw them lying on the earth, some half hidden, and try to make on your paper a tiny patch of Mother Earth's beautiful autumn carpet.

The best way to begin is to paint in the leaves that show the most. Then we put in the leaves that lie half under this central one. If we are not careful, the paint on the second leaf will run into the first and make a shapeless mess. We can avoid this by leaving an outline of dry paper round each leaf or round each part of a leaf.

hang from them; but if you have drawn flowers or leaves draw it separately in the corner of the paper, the long lines first meeting in a dot in the centre, and then the little short lines going round. Use the chisel-pointed pencil for the long lines and the other pencil for the short ones.

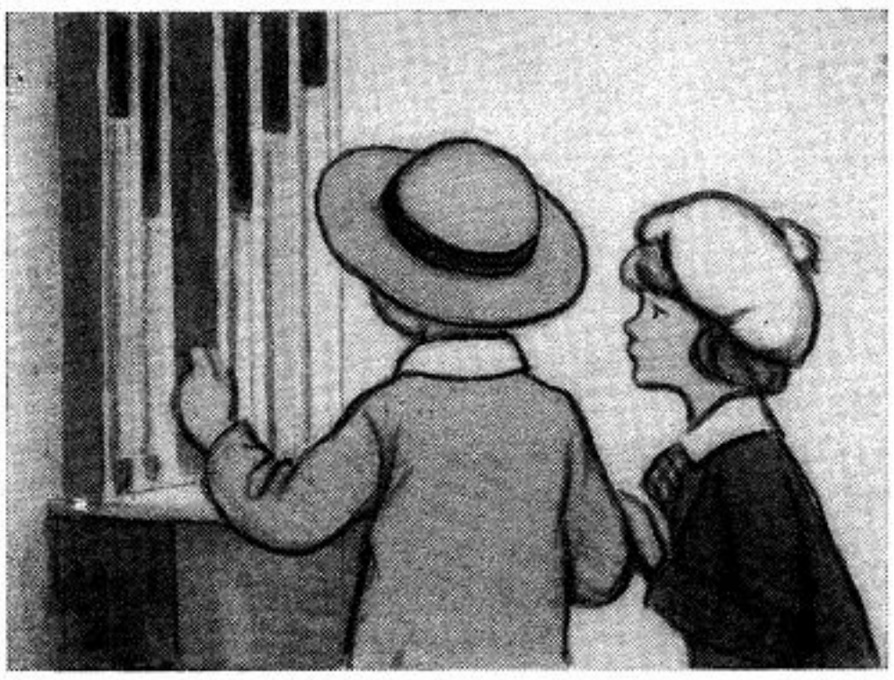
Remember that it is better to take another sheet of paper and make a fresh drawing if you do not like your work the first time you do it. If you use indiarubber the paper soon gets worn away, and the pencil lines never look well afterwards. Very often, too, the drawing looks dirty where the india-rubber has been used, so try to get the lines right the first time, and



Here is a cobweb between two twigs. Draw this in in pencil.

FRENCH—A LITTLE PICTURE LESSON

HERE we read of the little party on the platform. We must remember that the first line under the picture is the French, the second gives the English word for the French word above it, and the third shows how we make up the words into our own language

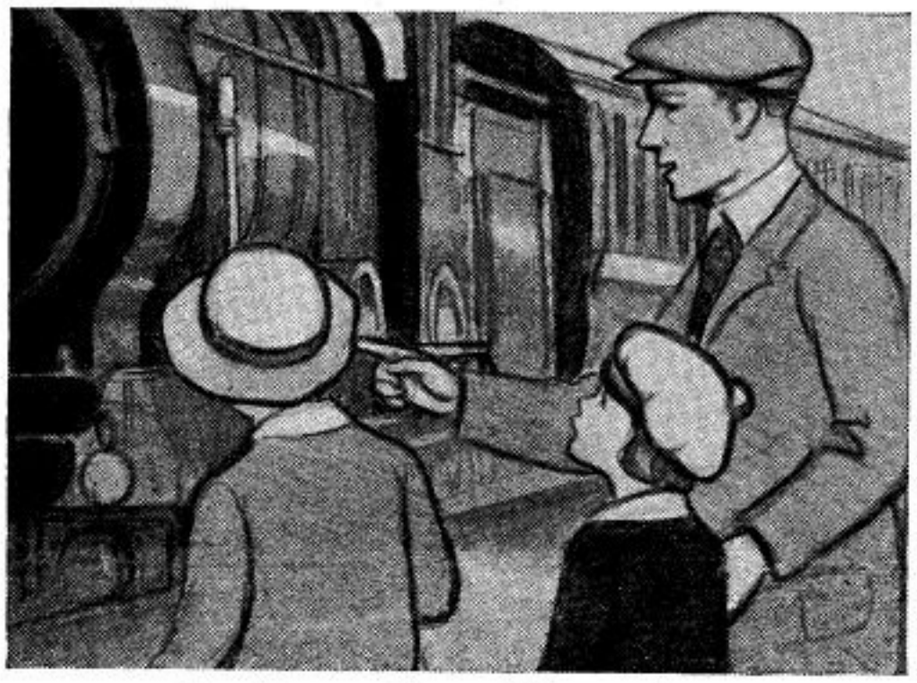


Une machine automatique—An automatic machine

Nous voyons une machine automatique
We see a machine automatic
We see an automatic machine

J'ai mis dix sous dans le trou
I have put ten sous in the hole
I have put a penny in the slot

Papa et maman viennent nous chercher
Papa and Mamma come us to find
Papa and Mamma are coming to find us

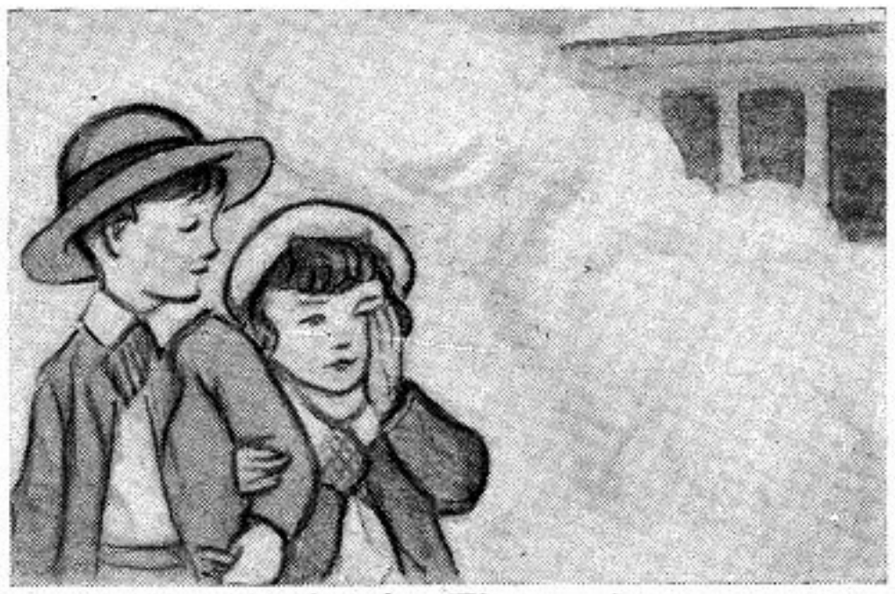


Les locomotives—The engines

Ils nous font voir les trains
They us make to see the trains
They show us the trains

J'aime les locomotives
I like the engines
I like the engines

Notre train est en vue. Il entre en gare
Our train is in sight. It enters in station
Our train is in sight. It is coming in the station

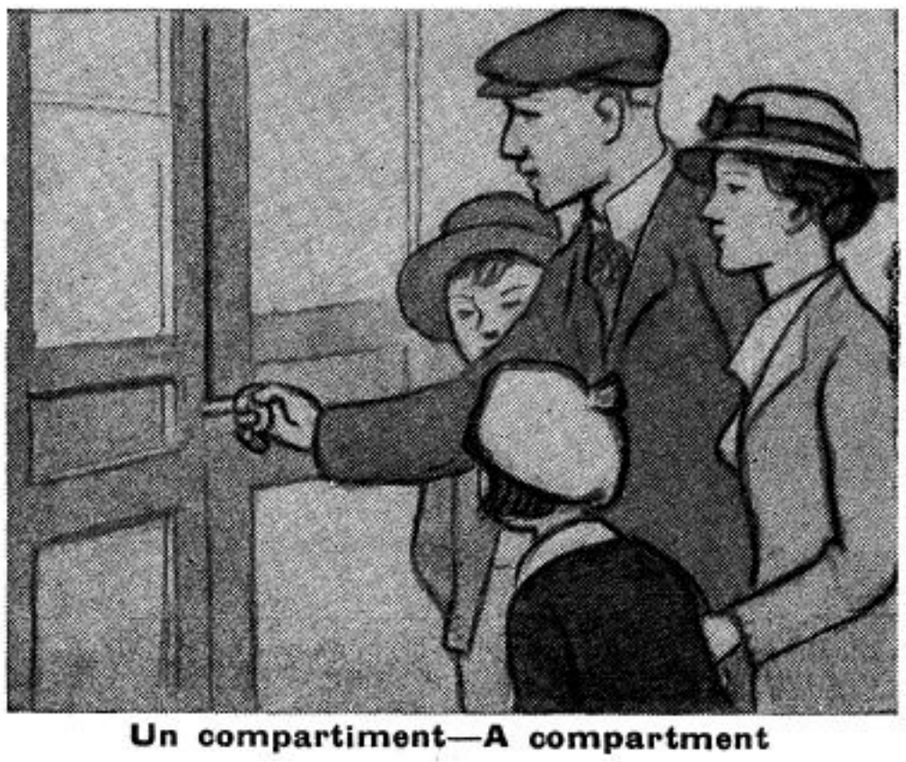


La fumée—The smoke

La fumée nous entre dans les yeux
The smoke us enters in the eyes
The smoke is getting in our eyes

L'employé—The porter

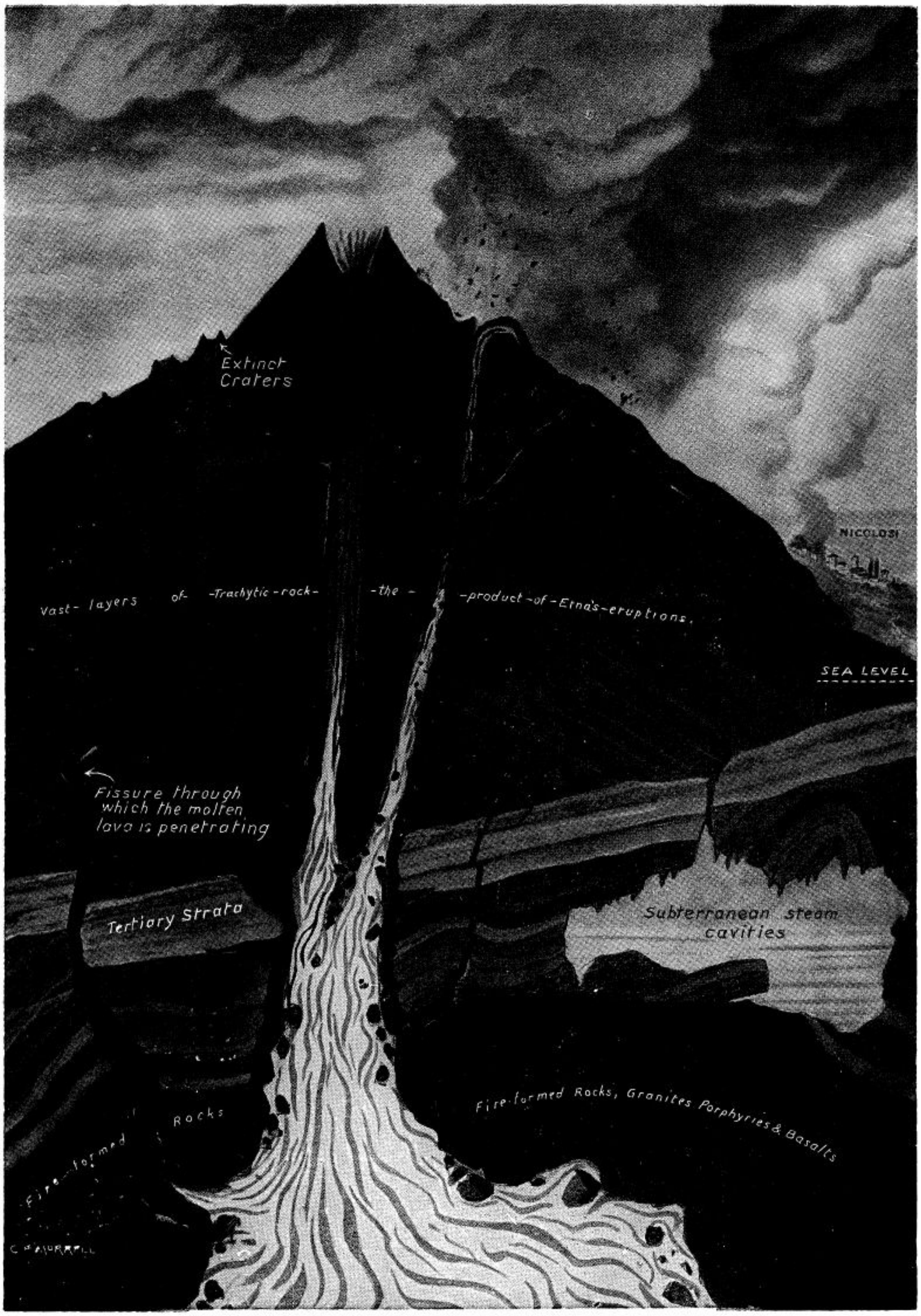
L'employé met nos malles dans le train
The porter puts our trunks in the train
The porter is putting our trunks in the train



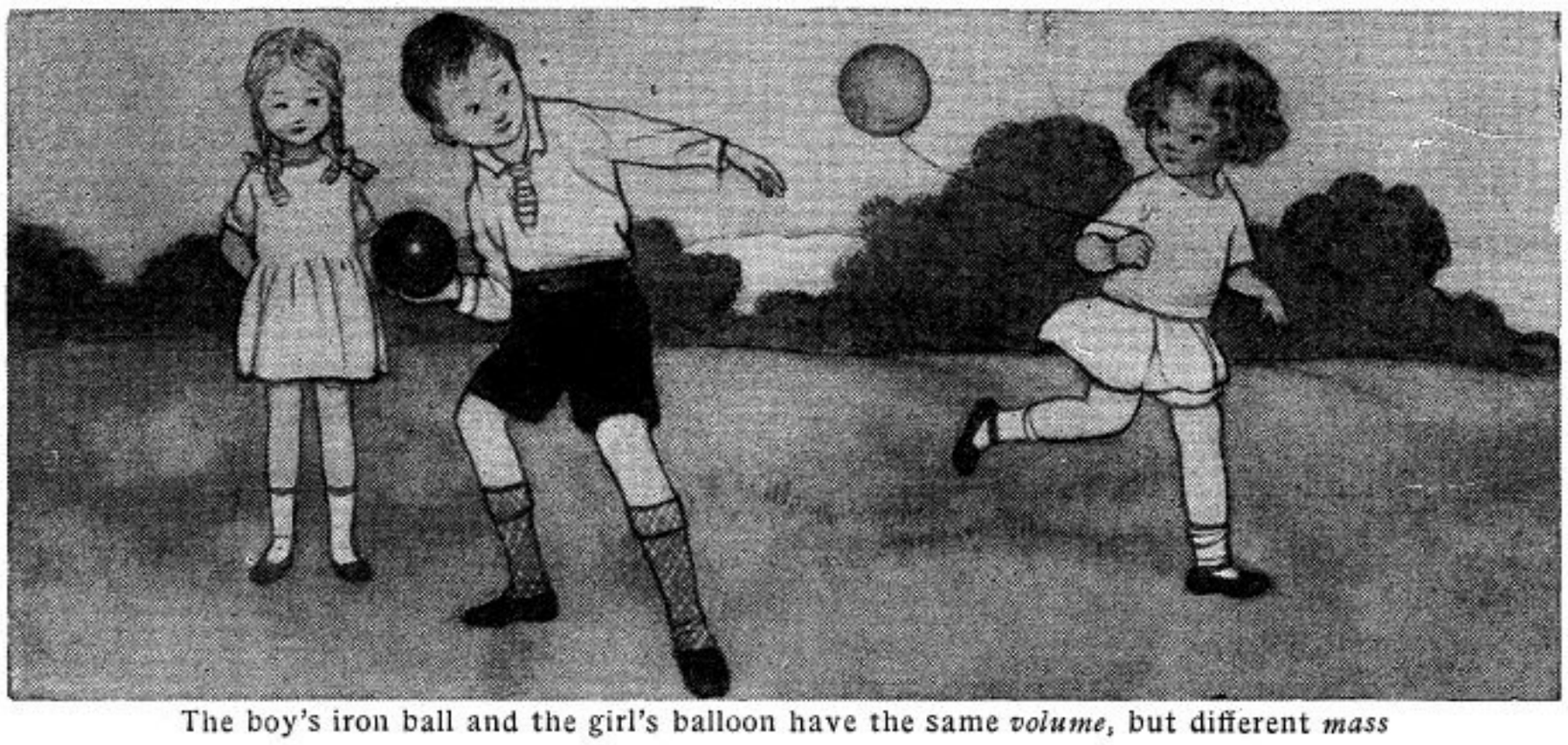
Un compartiment—A compartment

Papa choisit un compartiment
Papa chooses a compartment
Papa is choosing a compartment

HOW THE FIRES BURST FROM THE EARTH


Extinct Craters
Vast layers of Trachytic rock the product of Etna's eruptions.
SEA LEVEL
Fissure through which the molten lava is penetrating
Tertiary Strata
Subterranean steam cavities
Fire-formed Rocks
Fire-formed Rocks, Granites Porphyries & Basalts
NICOLOSI

THE CENTRAL FIRES OF THE EARTH SEEK AND FIND THE WEAKEST PARTS OF THE ROCKS AND BURST THROUGH THE CRUST AS VOLCANOES



The boy's iron ball and the girl's balloon have the same *volume*, but different *mass*

INSIDE THE WONDERFUL BALL

LET us think of the Earth as a colossal ball, a cricket-ball of a size unthinkable.

A cricket-ball has a certain weight, it has a cover, and inside this there is a core made of certain materials put together in a particular way. A cricket-ball is elastic, so that when you throw it against a wall it comes back again instead of spreading out and sticking to the wall, as a lump of mud would. Now, in the same way, we must look at the qualities of the great Earth-ball, tiny little pieces of which we put together to make cricket-balls, cathedrals, and other things.

In the first place, let us consider the size of this big ball. It measures round its circumference, roughly speaking, 25,000 miles. It is difficult to imagine such a great distance as 25,000 miles; yet, compared with some other things, the Earth is really small. There is a very good way of comparing the size of the Earth with that of the Sun. If the centre of the Sun could be placed at the centre of the Earth, the surface of the Sun would reach far beyond the distance that the Moon is from the Earth—that is to say, the Sun occupies far more space than the whole of the space swept by the Earth and the Moon moving steadily round her.

We will not bother with the figures which say how many square miles there are on the surface of the Earth, or how many millions of millions of tons it weighs, because we cannot realise what these figures mean, and so they are of no use to us at present. There is, however, one enormously interesting thing about the Earth which can be expressed in a way which we understand, and which is interesting because it means so much; and that is the question of the density of the Earth. Let us see what density is; how the density of the Earth can be found out; and what the Earth's density is, and what it means.

A lawn tennis-ball is bigger than a golf-ball but it is not so heavy. There is more stuff in the golf-ball than in the tennis-ball. A big piece of coal is heavier than a small piece of coal; there is more stuff in the bigger piece. But if you took two pieces of the same size and kind they would be the same weight—that is to say, they would have the same amount of stuff in them. Now, there is a special word for the size of a thing—for the amount of space it occupies. This special name is volume, and it is not difficult to understand, for it only means size, or bigness.

Now, as the tennis-ball and the golf-ball show, the volume of a thing tells us nothing about its weight, or, rather, about the amount of stuff in it—unless we can

compare it with a different volume of the same material, as in the case of pieces of coal of different size. So we want a special word to express the amount of stuff there is in any particular kind of thing as compared with a similar volume, or size, or bigness, of something else. You know what a cube is—a thing like the bricks you used to use for making pictures. If you can imagine a cube of water, such as you might have by pouring water into a cubical vessel, that would have a certain amount of stuff in it according to the size of the cube. If you poured the water out and filled the cube with mercury instead, you would have the same volume, or size, or bigness, of mercury, but it would be much heavier.

The mercury gets more stuff into the same space than the water does. Now, the proper way of saying this is that the mercury is *denser*, or has a greater *mass*, than the water. Perhaps you will say that you do not see any reason why we should not say the mercury is heavier than the water, but the objection is that, though it is quite true for here and now, yet the heaviness, or weight, of a thing depends upon the Earth's pull for it and its pull for the Earth; whereas the amount of stuff in it—which is what we are interested in—would remain the same even if the Earth were moved a million miles away, and so could hardly pull at all.

WHY THE SAME THING DOES NOT ALWAYS WEIGH THE SAME

Therefore, instead of describing the amount of stuff in a thing by the word *weight*, we use the word *mass*, or *denseness;* and the mass of a thing would remain the same even if it were moved to the Moon, where it would weigh far less, as the Moon is smaller and therefore pulls less hard.

Now, in order to compare the density, or *mass*, of different things, we take a certain volume of water under definite conditions, and call its density *one;* then, if we find that something else is twice as massive, or dense, as water, we say that its density is *two*—and so on. If the thing we were comparing with water were at the same distance from the centre of the Earth, then, if it were twice as dense as the water, the same volume, or bigness, of it would be twice as heavy, or would weigh twice as much.

Let us take one more illustration of why it is that the same thing does not always weigh the same. If we take two metal cubes of exactly the same size and material, and place them side by side on a flat table, then, besides being of the same density, or mass, they are also of the same weight. But if, instead of having the two cubes side by side, you put one on top of the other, though they are still of the same density, though there is still the same amount of stuff in the one as in the other, it can be shown that the one which is above weighs less than the other, because it is *a little bit farther from the Earth*, and therefore the Earth and it do not pull each other quite so hard! Let us agree, therefore, that there is some sense in distinguishing between mass and weight.

HOW DO WE FIND OUT THE MYSTERIES OF THE EARTH?

How are we to find out what is the density of the Earth? How are we to find out whether this great ball is less massive or dense than water, or more massive or dense? This is a problem which men of science have long been engaged on, and it has been thought out in various ways. Just now, perhaps, it is enough to say that if we can measure the extent to which the Earth makes a pendulum swing, and the rate at which the pendulum swings, we can measure the force with which the Earth acts upon it, and, therefore, as we already know, the size, or volume, or bigness, of the Earth, we can say how dense it is—that is to say, how tightly the stuff in it is packed.

Now the extremely remarkable conclusion to which we come is that the Earth is somewhere between four and six times as dense as water, and the stuff in the inside of it must be squeezed together more tightly than we can imagine. None of the things we know and can examine at the surface of the Earth, no rocks or coal, or anything of that sort, are nearly as dense as this average density of the Earth, and, therefore, away down beneath us, the stuff of which the Earth is made must be so tightly packed that the densest things we know, such as lead, can be almost nothing compared with it.

THE THIN CRUST OF THE EARTH UPON WHICH WE LIVE

This is not only very interesting in itself, but it is also important because of what it tells us as to the tremendous forces which are, so to speak, chained up underneath the Earth's crust.

Sometimes, as we know, these show themselves by means of earthquakes. It is also interesting to know that the

crust of the Earth, compared with the whole size of the Earth, is really extremely thin. It feels firm enough under our feet, and there is no fear of its cracking and letting us through, but if the Earth could be cut right through the middle like an orange we should be very much astonished, if we could take a sort of bird's-eye view of the whole cut surface, to see how thin is the crust on which we walk, and from which all living things have been produced.

Of course, when we learn that the inside of the Earth has this extraordinary density, we are apt to think of it as solid—far more solid than lead. But another great fact about it is that it is intensely hot, so hot that no heat we know on the surface of the Earth can compare with it. It is, indeed, probable that the inside of the Earth is so hot that the stuff of which it is made is not really solid at all. On the other hand, we may be wrong in thinking of it as liquid or as a gas, for it is more than likely that matter inside the Earth, owing to heat and pressure, has a state which is like nothing that we know.

IF WE COULD THROW THE EARTH AT A WALL IT WOULD BOUNCE!

We said something a little while ago about a cricket-ball being elastic, so that when it is thrown against a wall it comes back again, instead of spreading out and sticking there like a lump of wet mud. When we say that a thing is elastic, we simply mean that when it is put out of its shape it comes back to its old shape as soon as it can. When the cricket-ball hits the wall, it is flattened at one part for a twinkling of time, and then it springs back to its original shape, and that makes it bound back from the wall.

Now, if you could throw the great ball called the Earth against a wall, it would spring back more perfectly than a cricket-ball, more perfectly than a ball of steel.

There is a cheap kind of cricket-ball which is called a composition cricket-ball, often called compo, for short. This means that it is a composition of a number of things put together. Well, the Earth is also a compo, made up of a large number of different materials put together in a particular way, and this question of the composition of the Earth is immensely interesting. But before we go into that let us look at one of the latest things we have learnt about the composition of the Earth, because it tells us far more than ever we knew before about the Earth's history, about what is happening to it now, and about the wonderful way in which it is kept warm.

This is a perfectly wonderful discovery. The special kind of stuff with which it deals is very rare, but it is one of the substances which make up the Earth. There is so little of it, that if the stuff were not so wonderful in itself, it would not be worth mentioning. Its name is Radium. Before we consider why its discovery is so important, we will ask ourselves in what ways the Earth might be kept warm.

YEAR IN, YEAR OUT, THE EARTH IS LOSING ITS HEAT

In the first place, the Earth might be kept warm by the heat of the Sun—of which we catch only a very tiny amount, of course, but still enough to produce all the life on the Earth, our own included. However, during the night the Earth throws back into space the heat which is got from the Sun during the day, and as we know what night and day mean, we know that all the time one half of the Earth is getting heat from the Sun the other half is losing it.

Secondly, we know that the Earth is kept warm by the heat in its inside. The heat from the inside simply soaks outwards and keeps the crust warm, and then it passes away from the crust into the air, and is finally lost.

Year in, year out, then, the Earth is slowly giving forth heat, and, clearly, this could not go on for ever. The Moon, of course, was hot when it began, but it has got cool much faster than the Earth, because it is so very much smaller. A small thing always loses its heat faster than a big thing, because a small thing has a bigger amount of surface to lose its heat by in proportion to the amount of stuff in it. That is one reason why a baby has to be kept so very warmly clad.

FOR EVER AND EVER THE EARTH MAKES NEW HEAT FOR ITSELF

But, in spite of all we have said, the Earth is not losing heat. A few years ago the astonishing discovery was made of another way, dreamt of by nobody until this century, in which the Earth is kept warm, and has for ages past been kept warm—and will be kept warm for no one can say how many ages to come.

It is true that the Earth is giving forth its heat but we have discovered that,

while it is giving forth heat, it is actually *making new heat for itself.*

Of course, you see the importance of this. If you have six pennies in your pocket, and spend one every day, when a week is out you will have nothing left. But if, while still spending, you can also make a new penny every day—well, you can go on for a long time at that rate! Now, that is what the Earth is doing. It is spending its heat—which is a good thing for us, for we should not be here without it—but it is also making new heat. Nay, more; there is every reason to believe that the Earth is making every day, or every year, or every million years, at least as much heat as it loses. Now, the wonderful stuff which makes the new heat for the Earth is radium.

THE MOST WONDERFUL OF ALL THE ELEMENTS WE KNOW

It used to be thought that there were four elements—earth, air, fire, and water—and boys and girls still play a game based on that idea. But now we know that none of these is really an element. There are real elements, however, such as lead and gold and silver and quicksilver, and oxygen. Well, radium is just another of these elements. It is one of the last to be discovered, perhaps one of the rarest of all elements; but it is far more wonderful than all the other elements put together.

Now, one of the wonderful things about radium is that it is all the time making heat out of itself. Lead and silver and oxygen cannot do this. If they are warm it is because something has made them warm from outside, just as the poker—which is made of the element iron—becomes warm if you put it in the fire. But radium left by itself, without any warmth from outside, makes heat for itself, and, wherever you find it, it is always a little hotter than its surroundings—like nothing else in the whole world, except, of course, fire itself, and the heat produced by a fire is really heat from the Sun, which was stored up in the coal and was given out again.

THE STRANGE POWER IN RADIUM THAT WILL HEAT THE EARTH FOR AGES

The extraordinary thing about radium is that it does not require to be burnt in order to make heat, and that the heat which it makes is not the Sun's heat of the past given out again, but is absolutely made brand new, so to speak, on the spot.

Our new discovery, then, does not mean that the Earth has a source of heat which can never be used up, but that it has means of making heat which will probably not be exhausted for ages longer than we can think about.

But we have left out something; we have not satisfied ourselves that there is enough radium to do all these things. All the radium in the world *that has been collected* would not weigh as much as a golf-ball! Not only so, but there are only one or two known places in the world in which radium can be found. It is obtained from pitchblende found at Joachimsthal in Czecho-Slovakia, in Hungary, in parts of North America, and in the Belgian Congo, today the main source.

Yet, curiously enough, while there is only very little of it to be found anywhere, there is *a very little of it to be found everywhere.* Men have taken samples of water and every kind of earth and rock that we can think of, and wherever they make tests to find whether radium is present, there they invariably find it. Of course, the amount is extremely tiny.

NO MAN WILL EVER GET DOWN TO THE CENTRE OF THE EARTH

Now you will say next that, even supposing there is this tiny amount of radium in rocks and minerals in general, all over the crust of the Earth, and even supposing that some such quantity as this could be found in all the stuff that makes up the crust of the Earth—which is supposed to be about forty or fifty miles thick—yet surely such a tiny proportion could not be enough to make up, day by day, for the amount of heat which the Earth is always losing into space. But the extraordinary fact is that this very small amount of radium actually is enough for the production of enough heat to keep the Earth as warm as it is, as warm as it has been for ages past, and as warm as it will be for ages to come.

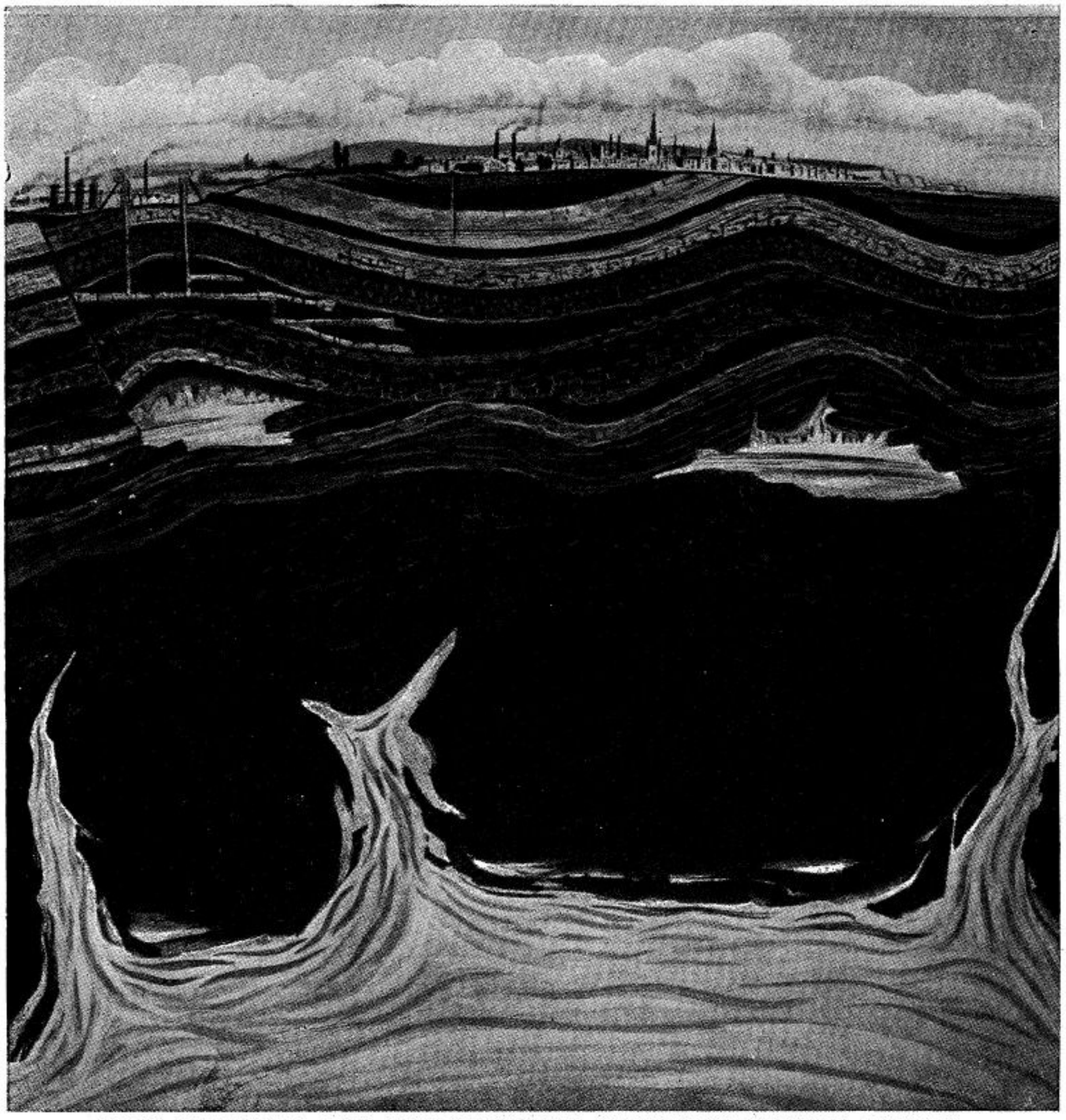
Now let us think over something very wonderful. Here we are on this Earth of ours, and we cannot leave it; but you might at least think that, though we cannot leave it alive, and perhaps do not want to leave it, at any rate we can thoroughly examine every part of it. Now, this is not so. There are parts of the Earth, even at the surface of it, which no human eye has ever seen, and only in recent years have we reached the North and South Poles. The ocean of air that

floats above us is part of the Earth, of course, and it probably extends at least something like a hundred miles high. No one has ever been as high as a sixth part of this distance.

Then, again, as to digging downwards. Certainly, no human being will ever get down to the interior of the Earth. His whole body would have melted into gas long before he got there. But take this thin crust, which has produced such wonders. Compared with the whole thickness of the Earth, it is a mere nothing—40 miles out of 8000; that is to say, the crust of the Earth is 200 times thinner than the Earth itself.

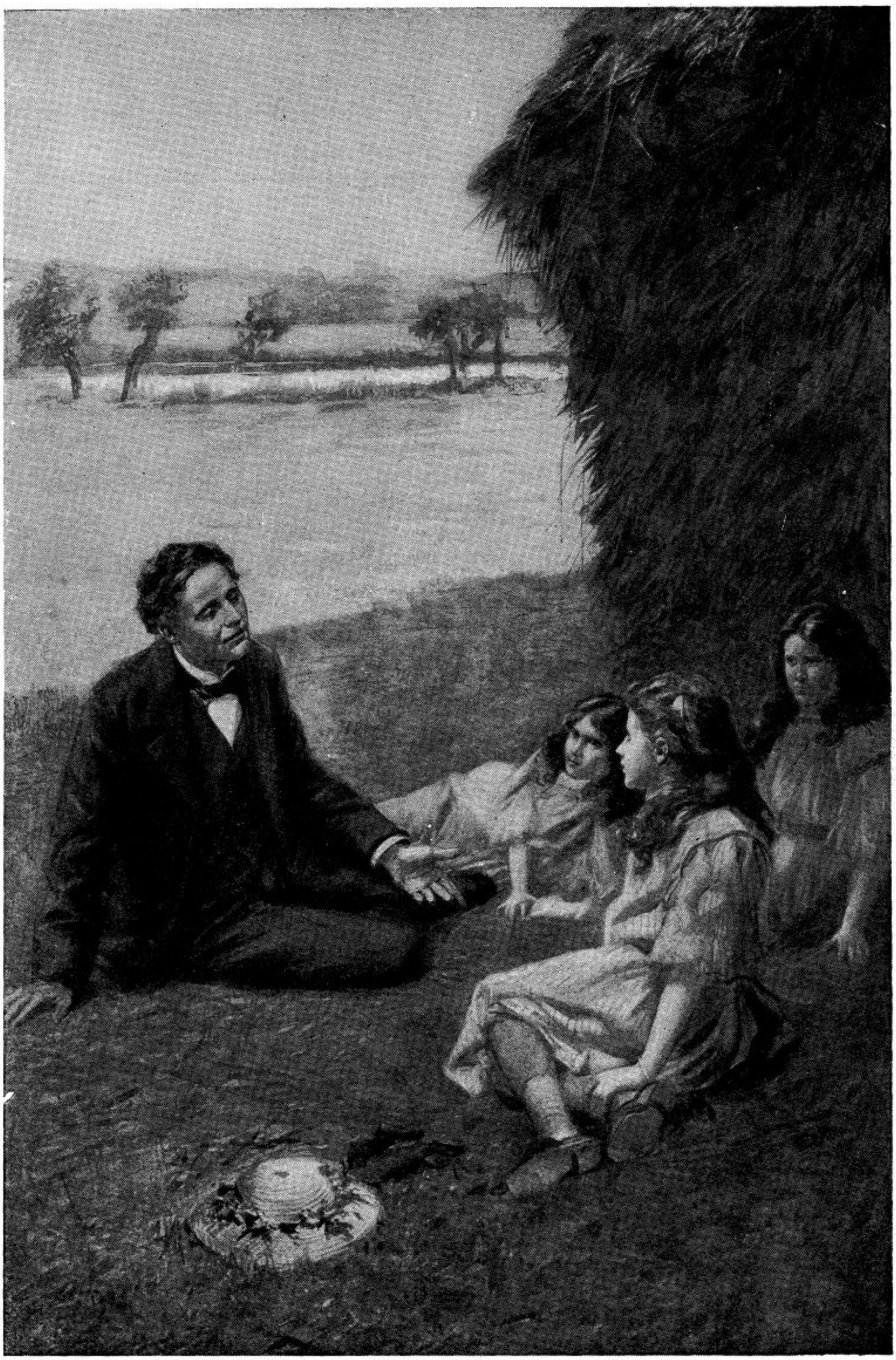
A little while ago we were talking about cutting the Earth in half and seeing what it would look like. What have we done in the way of cutting into this thin crust that supports us? Practically nothing. We measure coal-mines by thousands of feet, but as we go down it gets very hot, and it is a very serious matter to get air enough down to these levels. When all is said and done, the deepest coal-mine has only got as far as the coal level, and that, compared with the whole crust of the Earth, is almost nothing at all.

Yet every day the mind is teaching us more about the Earth. Every day the eyes of our minds are getting to see farther and farther, and wider and wider, and to see more and more at a time, and to understand what it is that they see. And there is always more to be known.



INSIDE THE EARTH—THE SOLID CRUST AND THE RAGING FURNACE BENEATH

THE FIRST TELLING OF ALICE IN WONDERLAND



LEWIS CARROLL TELLS HIS LITTLE FRIENDS THE STORY OF ALICE

The Story of Immortal Folk Whose Work Will Never Die

Charles Kingsley

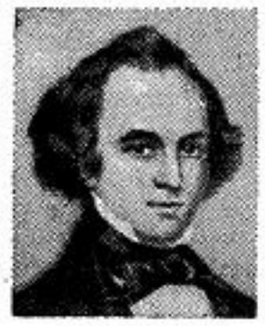
Sir J. M. Barrie

Jacob Grimm

Wilhelm Grimm

Hans Andersen

George Macdonald


Hawthorne

Lewis Carroll

Madame d'Aulnoy

Charles Perrault

J. C. Harris

Carl Ewald

THE FAIRY-STORY PEOPLE

IN Venice, that marvellous city which is itself a fairy story, there lived in the early years of the sixteenth century Giovanni Francesco Straparola.

We know very little about this Straparola, except that he was a writer of stories. In those days Venice was the wonder of the world, and all sorts of clever men were drawn to the town because of its riches, and the splendid company to be found there.

Straparola was a clever Italian who had gone there doubtless because it was a famous place for printing books ; and there for many years, in some unknown house by the side of some old canal, this man with the strange-sounding name wrote his stories and got them printed in the lovely city of the sea. He first wrote Puss in Boots, except that his Puss wore no boots.

Towards the end of the seventeenth century, and in the early years of the eighteenth, the pleasant land of France was noted for its writers of fairy tales, It was then that Blue Beard, Little Red Riding Hood, The Sleeping Beauty. Mother Goose, Beauty and the Beast, and many another of our old favourites first took the form in which we know them.

The two great writers of fairy stories at that time were a Parisian named Charles Perrault, and the French countess, Madame D'Aulnoy. We see how grateful we should be for many of our happiest hours to that forgotten Straparola, when we are told that both Perrault and the countess got most of their ideas from his writings.

He must have been a kindly old gentleman, this Monsieur Perrault—who was busy with the affairs of State, being the official in charge of the Royal buildings, and a member of the great French Academy—to have found time and delight in telling his own children these charming stories, and writing them down for the children of the world. He was nearly seventy when his principal book of fairy stories appeared, and he made believe the stories were told by one of his own children, which was only a pretty device for commending them to other young folk ; for Perrault, though a learned scholar, was not ashamed to set the fashion of writing fairy stories. The proper title of his book was Stories or Tales of Past Times, but it had another and better title, Tales of Mother Goose.

One of the many grand ladies who lived in France at the same time as Perrault was Madame D'Aulnoy. The White Cat, The Yellow Dwarf, The Fair One with the Golden Locks, Cinderella, and many

nother nursery favourite were shaped by her pen from the earlier tales of Straparola. There were many other ladies who, about the time of Madame D'Aulnoy and somewhat later, practised this delightful art of weaving fairy tales, but, as they all borrowed from the little-known writer who plied his pen by the sparkling waters of Venice a hundred years before them, our thanks for the pleasure of these old tales are perhaps more due to him.

THE GRAVE AND LEARNED SCHOLARS WHO TOLD THE JOLLY TALES

What delight is associated with the otherwise forbidding name of Grimm! Tom Thumb, The Queen Bee, Hansel and Gretel, The Frog Prince, Rum-pel-stilt-skin, and many other stories that boys and girls for nearly a hundred years have been reading with endless entertainment, were all written down by two brothers named Grimm, who lived in Germany during the first half of last century. Jacob Grimm was the elder of the two brothers, being born at the town of Hanau on January 4, 1785, while his brother Wilhelm was born on February 24, 1786.

These two brothers were probably not in the least like the sort of people one would expect to be fond of telling fairy tales. As a matter of fact, they were sober, industrious scholars whose whole lives were devoted to literary studies and teaching, both of them becoming professors at the university of Berlin. Grave and learned gentlemen they were, whose greatest concern was to produce books of a kind that only students read, yet they quite unconsciously made themselves famous for ever by collecting the old German fairy stories into a book, which has been translated into all the principal languages of the world, and has made the name of the brothers Grimm as well known in England and America as it was in their native land.

They went out together, these two industrious scholars, among the country-people of Germany, and induced them to tell such stories as they knew of the fairies. What a charming occupation, and how delightful were the results!

HANS CHRISTIAN ANDERSEN, THE LONG AND LANKY COBBLER'S SON

The other name that stands beside the Grimms in fame is that of Hans Christian Andersen, the great Danish storyteller, who is really a much abler writer than the Grimms. Hans Andersen was certainly one who knew the fairies, as most of his wonderful stories—such as Little Klaus and Big Klaus, The Little Mermaid, The Tinder-Box, The Wild Swans, The Ugly Duckling, and The Snow Queen—were told to him not by the peasant-folk, but by the fairies of his own brain. We might almost say that while Hans Andersen knew the fairies, the Grimms, and the others we have spoken about, only knew the folk who knew the fairies.

A wonderful and strange man was Hans Christian Andersen. The son of a poor cobbler, he was born in the year 1805 in the ancient city of Odense, in Denmark. The poor cobbler was a learned man in his way, and used to read books at night with his son Hans, who was growing up a long, lanky lad. But neither his father nor mother was sufficiently strict about his attending school, so that as a boy his education was irregular.

He was perhaps more sensitive than most children, being of a nervous, highly-strung nature, and his mother found it necessary to arrange at the first school he attended that he should never be birched. One day, when the mistress gave him a slight tap with the rod, he immediately took up his books and slate and marched off home. His mother then sent him to another school, where was a tiny girl who once told Hans that her ambition was to be a dairymaid at a large country house.

WHAT HAPPENED WHEN HANS ANDERSEN TOLD HIS FIRST FAIRY TALE

"You shall be a dairymaid at my castle when I am a gentleman," said the boy in jest, and he drew upon his slate a rough picture of what his castle was like. The little fairies of the brain were already at work prompting him to tell strange stories about himself. So he went on to assure the little scholar that he was really of noble birth, but that the fairies had changed him in his cradle.

The girl was very matter-of-fact, and she only replied to his fanciful tale by turning to some playmates and exclaiming, "He is mad, like his grandfather." Alas, it was true his grandfather was weak-witted, and this unhappy reception of one of his earliest efforts to tell a fairy story must have filled the boy with dread.

It would be a long story if we were to follow the incidents of Hans Andersen's life, though everything concerning this strange genius would be well worth telling.

But we can mention only a very few of the facts of his life.

His father died when the lad was eleven, and even at that age he had made very poor use of his schooling, dreaming and idling his time away.

It was not very long before he had a stepfather, and soon he had to think of making his way in the world by going to Copenhagen, the capital of his country.

HOW HANS ANDERSEN SET OUT TO MAKE HIS FORTUNE

It was all because of having appeared on the stage of the theatre at Odense in a very tiny part in Cinderella, and having written a boyish play which he thought good enough for the stage, that long, dreamy Hans, the laughing-stock of all the lads of Odense, set off on the coach with a little bundle packed by his mother and and the sum of 37 shillings in his pocket to seek out fame and fortune in Copenhagen. Many a sad and hungry day he was to endure before he was famous, and even after his name was known throughout Europe he was so poor a man of business, and made so little money from his stories, that he had grown into an old bachelor before he could have afforded to marry.

So he never had any children of his own to listen to his fairy tales which have charmed the children of all the world. Nor did he think so much of these tales himself at first. His ambition was to be a great dramatist or novelist or poet. Some success he had in each of these branches of the literary art, and indeed, for a time, was very famous as a novelist.

His fairy stories were written at first to please his own fancy or to entertain the children of friends in Copenhagen; but it was fairy stories the world wanted him to write, and although his novels and poems, as well as his plays, are now seldom read the world will never let the fairy tales of Hans Christian Andersen, the poor cobbler's son, who died in 1875, be forgotten.

NATHANIEL HAWTHORNE, THE AMERICAN WHO WROTE "THE WONDER BOOK"

We now take a long imaginary trip across the Atlantic Ocean to that pleasant part of America which is called New England, to visit the old home of the storyteller, Nathaniel Hawthorne.

He, too, was born in an old-fashioned town and lived among old-fashioned people; for Salem, in the State of Massachusetts, some fifteen miles distant from the great town of Boston, was one of the old homes of the Puritans. It was there that Hawthorne was born in 1804. His ancestors for generations had been seafaring folk, and from one of his long and dangerous voyages his own father never returned.

Nathaniel seems to have been an imaginative, sensitive boy, proud of his brave forefathers and his beautiful mother. He entered into all sorts of boyish games, but meeting with an accident at bat and ball he was crippled for a time, and during those days he became a great reader. He was very fond of Spenser's Faerie Queen and Bunyan's Pilgrim's Progress. A little later he had another illness, and had to stay so long an invalid that he could only pass his time in book-reading. But his accident and his illness were not altogether misfortunes, for they stored his young mind with so much of what is best in English literature.

Hawthorne had written a great many beautiful stories before he began the book which should endear his name to all young people and entitles him to come into our little company of those who knew the fairies. This is called The Wonder Book, and is one of the most delightful series of fairy stories ever written, telling over again, with a wonderful freshness, the strange old legends of Greece.

THE STORYTELLERS OF IRELAND, A REAL HOME OF FAIRIES

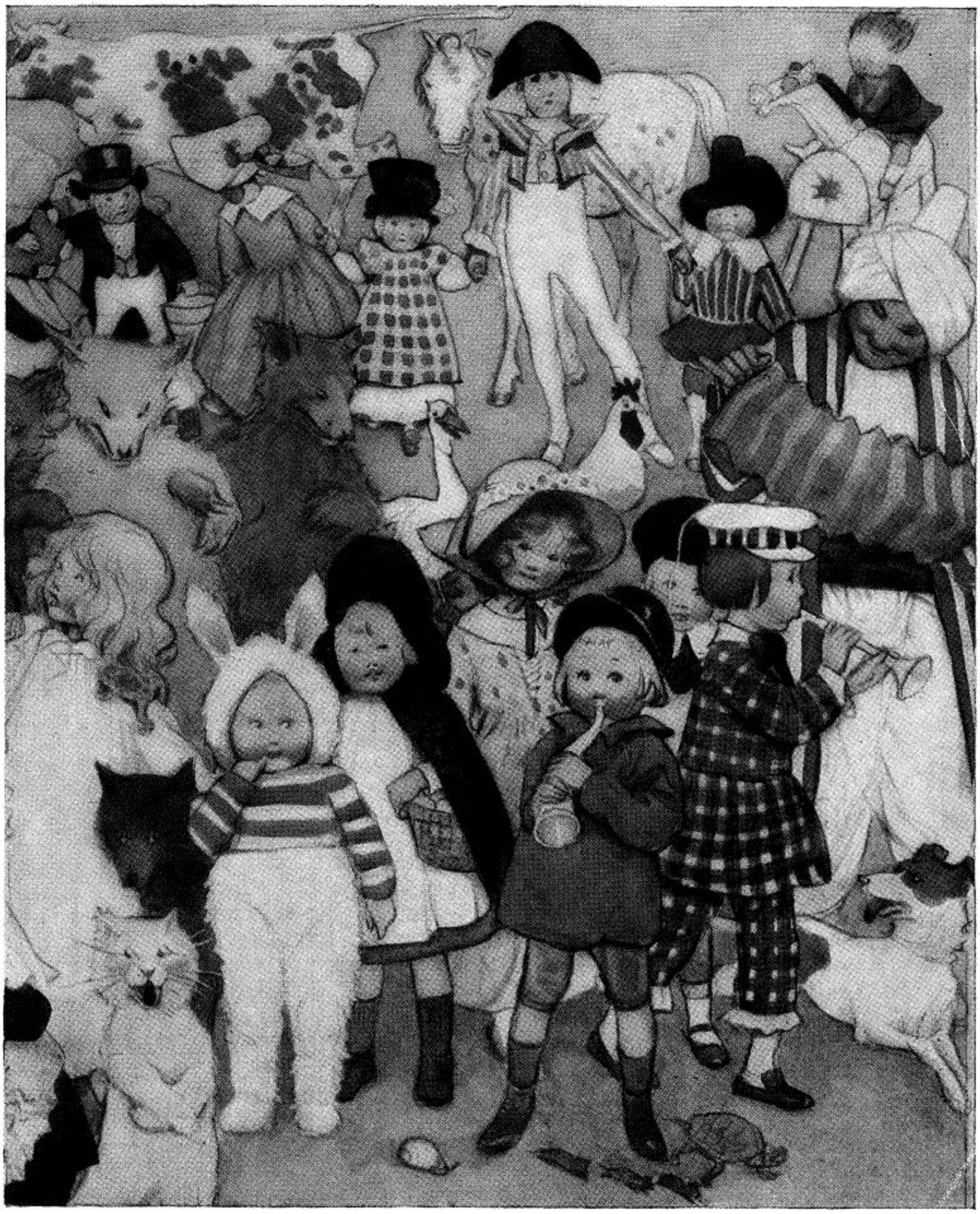
Ireland is a real home of fairies, the Irish people having had in the old days far more stories of "the wee folk," as the fairies are often called, than the English. So it is surprising that there are not many Irish storytellers. We must remember one of the few there are—a blind Irish lady named Frances Browne, who wrote Granny's Wonderful Chair. The fairy stories told from Granny's wonderful chair are full of delicious fancy and bright with pictures of Nature. Yet it would not be too much to say that there is nothing so wonderful about them as the fact that their gay and lively scenes could have been described by a poor woman whose eyes had never looked upon the beauties of Nature. Frances Browne was blind from infancy, but she had that inner vision which enables its possessor to see into the mysteries of life with the eyes of the soul.

A wonderful figure in every way was this poor Irish woman, and since she had not the use of her eyes, she developed the use of

THE FRIENDS OF ALL OUR CHILDHOOD

WHAT is there in the world that can rival the portrait gallery of the immortal creations of the storytellers, that great procession of wondrous people known all over the world? Here we meet a few of them, with some real people we all know. We see the genuine Puss in Boots, Little Miss Muffet with her Spider (though it does not sit down beside her), the Cheshire Cat wearing its most amiable grin, the Snail that frightened the Four-and-Twenty Tailors, the Three Blind Mice, Little Boy Blue blowing his Hunting Horn, Little Red Riding Hood as innocent as her Wolf is shy, Ali Baba, Nelly Bly

DAYS FROM THE MAGIC WORLD OF STORY



holding with admiring confidence the hand of Old Mother Goose, Henry the Eighth (our real and royal Bluebeard) in his jolliest mood, and Rip Van Winkle who went to sleep for twenty years, the Cow that Jumped over the Moon, Joan of Arc, the Three Bears, showing that, after all, their sizes were not so very different, the Cock that Crowed in the Morn, Old Mother Hubbard and her expecting Dog, Dapple Grey, George Washington grown up, and many more of the immortal friends that live with us for ever in the magic world of childhood. What a merry company they are, all in their colours !

other faculties. For example, while her brothers and sisters were saying their lessons aloud for the next day at school, she would learn their lessons by heart, and to induce them to read to her she began inventing stories from her own imagination.

When only seven, Frances Browne had composed a poem, but at fifteen she was so impressed with the wonderful music of Homer's Iliad that she had her own poor childish efforts destroyed, and did not again attempt to compose poems until she was 24. From that age onwards she composed much charming verse and many stories, removing from her Irish home to Edinburgh, where she became a busy contributor to the magazines.

THE BLIND IRISH LADY WHO WROTE "GRANNY'S WONDERFUL CHAIR"

Granny's Wonderful Chair she wrote in 1856, after settling in London, and it immediately became the favourite fairy story book of the day. Her last novel was written in 1887, when she was 71; and the life of Frances Browne, though one of comparative poverty, was rich in the pleasures of the imagination and in the joy her fairy stories have brought, and still bring, to multitudes of readers.

That fine novelist and splendid type of the Christian gentleman, Charles Kingsley, might be included here, for did he not write The Water Babies, which he must have had from the fairies? But we shall have to speak of him among the writers of great books, and so we pass to one who is surely the greatest of all our modern explorers of fairyland—none other than the creator of Alice in Wonderland.

On the title-pages of his books we know this most celebrated of modern fairy storytellers as Lewis Carroll, but in real life he had a very different and much less attractive name—Charles Lutwidge Dodgson. But we will think of him as Lewis Carroll, the favourite storyteller for boys and girls.

THE STORYTELLER WHO FIRST TOOK US ALL TO WONDERLAND

Everybody, of course, reads Alice in Wonderland, and perhaps his other fairy books as well—Through the Looking-Glass, The Hunting of the Snark, and Sylvie and Bruno. It is quite unnecessary to recall the names of the many strange characters, such as the Mad Hatter, Tweedledum and Tweedledee, the White Rabbit, and all that varied throng with which every boy and girl loses no time in making acquaintance.

But what sort of a man was he from whose brain of teeming fancies these strange and delightful creatures came? Should we picture him as a jolly, middle-aged gentleman, leading a life free from care, and happiest with his children round his knees, telling stories?

Such a picture would be curiously incorrect, for Lewis Carroll was in certain ways as strange a character as some of his own fairy folk. In the first place, he was, of all things in the world, a mathematician, and lectured at Oxford University on that science which is the terror of most young scholars. Perhaps it was because he spent so much time over difficult problems in mathematics that he liked to clear and refresh his brain with humorous thoughts and happy fancies, which he turned into the shape of fantastic stories for the amusement of the children of his friends.

Perhaps he was just a little moody, being sometimes rather a dull companion to grown-ups, and although he was 66 at the time of his death, on January 14, 1898, he had never been married.

HOW LEWIS CARROLL TOLD ALICE A STORY ON THE RIVER BANK

He was young when he wrote his immortal story of Alice's Adventures in Wonderland, first published in 1865. There really was a little girl named Alice, one of the many little girls who were delighted when Lewis Carroll came to visit their parents, as they had never any difficulty in getting him to tell a story. The real Alice was a daughter of Dean Liddell, and she herself has told us how the story was begun.

We cannot do better than let the words of the real Alice be heard again. "Most of Mr. Dodgson's stories," she says, "were told to us on river expeditions to Nuneham or Godstow, near Oxford. My eldest sister, now Mrs. Skene, was Prima, I was Secunda, and Tertia was my sister Edith. I believe the beginning of Alice was told one summer afternoon when the sun was so burning that we had landed in the meadows down the river, deserting the boat to take refuge in the only bit of shade to be found, which was under a new-made hayrick. Here from all three came the old petition of 'Tell us a story,' and so began the ever-delightful tale.

"Sometimes, to tease us—and perhaps being really tired—Mr. Dodgson would

HANS ANDERSEN'S DREAM OF FAIRYLAND

HANS ANDERSEN SITS DREAMING AMONG THE FRIENDS HE MADE FAMOUS IN HIS FAIRY TALES

stop suddenly and say, 'And that's all till next time.' 'Ah, but it is next time!' would be the exclamation from all three, and after some persuasion the story would start afresh. Another day, perhaps, the story would begin in the boat, and Mr. Dodgson, in the middle of telling a thrilling adventure, would pretend to go fast asleep, to our great dismay."

HOW THE FIRST TALE OF ALICE IN WONDERLAND WAS TOLD

Is not that a pretty story of how the gate was opened that leads us into Wonderland? Lewis Carroll himself has told us of that afternoon when little Alice Liddell and her sisters first induced him to begin describing Wonderland, for at the beginning of his book we read of it in these lively verses.

All in the golden afternoon
Full leisurely we glide;
For both our oars, with little skill,
By little arms are plied;
While little hands make vain pretence
Our wanderings to guide.

Ah, cruel Three! In such an hour,
Beneath such dreamy weather,
To beg a tale of breath too weak
To stir the tiniest feather!
Yet what can one poor voice avail
Against three tongues together?

Anon, to sudden silence won,
In fancy they pursue
The dream-child moving through a land
Of wonders wild and new,
In friendly chat with bird or beast,
And half believe it true.

And ever, as the story drained
The wells of fancy dry,
And faintly strove that weary one
To put the subject by,
"The rest next time." "It *is* next time!"
The happy voices cry.

Thus grew the tale of Wonderland;
Thus slowly, one by one,
Its quaint events were hammered out—
And now the tale is done;
And home we steer, a happy crew,
Beneath the setting sun.

HOW LEWIS CARROLL FOUND A GIRL READING ALICE IN THE TRAIN

One story of Lewis Carroll we must find room for. He was travelling in a railway carriage one day with a lady and her little daughter, neither of whom he knew. The girl was reading his famous book, and he, who always pretended that Mr. Dodgson was no relation of Mr. Lewis Carroll, began talking to the little reader about Alice in Wonderland. At this her mother joined in and said:

"Isn't it sad about poor Mr. Lewis Carroll? He's gone mad, you know."

"Indeed," said the astonished author, "I had never heard that."

"Oh, I assure you, it is quite true; I have it on the best authority!"

A few days later the little girl received a copy of Through the Looking-glass inscribed with her name and the words: "From the author, in memory of a pleasant journey."

It was not only to the little girls that Lewis Carroll told his stories. Little boys also were his friends, and one of these was named Greville Macdonald, whom he almost convinced on one occasion that it would be an excellent thing to have a marble head, as he would not need to comb his hair!

The father of this boy was a very famous man, a great preacher, the author of many fine novels, a poet. His name was George Macdonald. He, too, was one who knew the fairies, and he wrote for us many books of fairy tales—At the Back of North Wind, The Princess and the Goblin, and many more. Early in the present century his son Greville, prepared a beautiful new edition of his father's famous stories. George Macdonald was born in Scotland in 1824 and died in 1905.

THE BEST OF ALL THE FAIRY PLAYS, PETER PAN

There are, of course, many other fairy-story tellers. Joel Chandler Harris, the American writer, who was born in 1848, and died on July 4, 1908, told those wonderful negro tales of Uncle Remus, in which Brer Fox and Brer Rabbit and the Tar Baby have such wonderful parts to play; and Carl Ewald, a Danish schoolmaster, born in 1856 and died in 1908, who wrote Mr. Two-Legs, and seventy other fairy tales. When we have mentioned them, we have noticed most of those who knew the fairies.

Though, after all, we may be asked, "What about Peter Pan?"

Certainly Sir J. M. Barrie, the writer of that most charming of all the fairy plays, knows the little folk as well as anyone; and no man seems to have in him a finer touch of fairy life than he. But we shall have to read of him elsewhere, as a writer of greater books than Peter Pan; and here we leave our fairy story people.

The Great Stories of the World That Will Be Told for Ever

LITTLE GOODY TWOSHOES

All the world must allow that Two-shoes was not her real name. No: her father's name was Meanwell, and he was for many years a well-to-do farmer in the parish where Margery was born; but bad times came; he and his wife died, leaving Margery and her little brother to the mercies of the wide, wide world.

Little Margery and Tommy were both very ragged, and Tommy had two shoes, but Margery had but one. They had nothing, poor things, but their love for each other. Their relatives took no notice of them; but Mr Smith, a good-hearted clergyman who lived in the parish where little Margery and Tommy were born, sent for the children. A friend of his ordered little Margery a new pair of shoes, gave Mr Smith some money to buy her clothes, and said he would take Tommy and make him a sailor, while Mr Smith promised to look after Margery.

Next morning the shoemaker came in with Margery's new shoes. She ran out to Mrs Smith as soon as they were put on, and cried out:

"Two shoes, Mamma; see, two shoes!"

And so she behaved to all the people she met, and thus got herself the name of Goody Twoshoes, though her playmates called her Old Goody Twoshoes.

Little Margery was very happy in the home of Mr and Mrs Smith. She saw how good and how wise Mr Smith was, and concluded that this was owing to his great learning, therefore she wanted, above all things, to learn to read. For this purpose she used to meet the little boys and girls as they came from school, borrow their books, and sit down and read till they returned. By this means she soon learned more than her playmates, and devised a scheme for teaching those who were more ignorant than herself.

She knew that only twenty-six letters were required to spell all the words we ever need; but as some of these letters are large and some small, she, with her knife, cut out of several pieces of wood, ten sets of each of the small ones and six sets of each of the large ones.

Every morning she used to go round with the wooden letters in a basket to teach the children.

Mrs Smith once went with her on her rounds. The first house they came to was Farmer Wilson's. Here Margery stopped, and ran up to the door, giving a tap.

"Who's there?"

"Only little Goody Twoshoes," answers Margery, "come to teach Billy."

"Oh, little Goody," says Mrs Wilson, with pleasure in her face, "I am glad to

see you ! Billy is quite ready for you, for he has learned all his lessons."

Then out came the little boy, Billy.

" How do, Doody Twoshoes ? " says he, not being able to speak very plainly.

Yet this little boy had learned all his letters ; for she threw down the alphabet all mixed together, and he picked them up, called them by their right names, and put them all in order.

The next place they came to was Gaffer Cook's cottage. Here some poor children met to learn. They all came round little Margery at once ; and, having pulled out her letters, she asked the boy next her what he had for dinner.

He answered," Bread." Indeed they were so poor that they lived on very little else.

" Well, then," says she, " put the first letter down here."

He then put up the letter *B*, to which he next added *r*, and the next *e*, the next *a*, the next *d*, and it stood thus : *Bread*.

" And what had you, Polly Comb, for your dinner ? "

" Apple-pie," answered the little girl ; and so the lesson went on.

The next place they came to was Farmer Thompson's, where there were a great many little ones waiting for her.

" Little Mrs Goody Twoshoes," says one of them, " what have you been doing all this time ? "

" I have been teaching," says she, " longer than I intended, and am afraid I am come too soon for you now."

" No, but indeed you are not," replied the other, " for I know my lesson, and so does Sally Dawson, and so does Harry Wilson, and so do we all."

" Why, then," says she, " you are all very good, and God will love you ; so let us begin our lesson."

They all huddled round her, and, though at the other place they were concerned with words and syllables, here were children of much greater ability, who dealt in sentences, which they set up and read aloud.

Mrs Williams, who kept what we should call today an old-fashioned Dame's School, was at this time very old and infirm, and it was decided that Margery should take up her work. Henceforth she was known as Mrs Margery.

One day Mrs Margery brought home a fine raven which she had rescued from the cruel hands of some village boys.

Now, this bird, which she called Ralph, she taught to speak, to spell, and to read. He sat at her elbow, and when any of the children were wrong she used to call out, " Put them right, Ralph."

She had also a pigeon, which she had taught to spell and read, though not to talk. He was a very pretty fellow, and she called him Tom.

Soon after this a present was made to Mrs Margery of a little dog, Jumper, and a pretty dog he was. Jumper was the porter of the college, for he would let nobody go out or come in without the leave of his mistress.

One Thursday morning Jumper all of a sudden laid hold of his mistress's apron, and endeavoured to pull her out of the school. She was at first surprised ; but she followed him to see what it was he wanted her for.

No sooner had he led her into the garden than he ran back and pulled out one of the children in the same manner ; upon which she ordered them all to leave the school immediately, and they had not been out five minutes before the top of the house fell in.

The downfall of the school was a great misfortune to Mrs Margery, for she not only lost all her books, but was without a place to teach in. But soon after a friend had it rebuilt for her.

Mrs Margery was much esteemed by her neighbours. One gentleman, Sir Charles Jones, had conceived such a high opinion of her that he offered her a considerable sum to take care of his family; but she refused. This gentleman sent for her afterwards when he had a dangerous illness, and she nursed him so well that he made her promise to marry him.

The wedding day arrived, and they went to church. But just as the clergyman had opened his book a gentleman ran into the church and cried : " Stop ! Stop ! "

This gentleman turned out to be Mrs Margery's brother, who had just come from beyond the sea, where he had made a large fortune, and, hearing of his sister's intended wedding, he had ridden in great haste to see that a proper settlement was made on her.

Mrs Margery, after her marriage, still went on with her good works. She was a mother to the poor, a doctor to the sick, and a friend to all in distress, and she was loved by everybody.

THE OLD MAN OF THE PIT

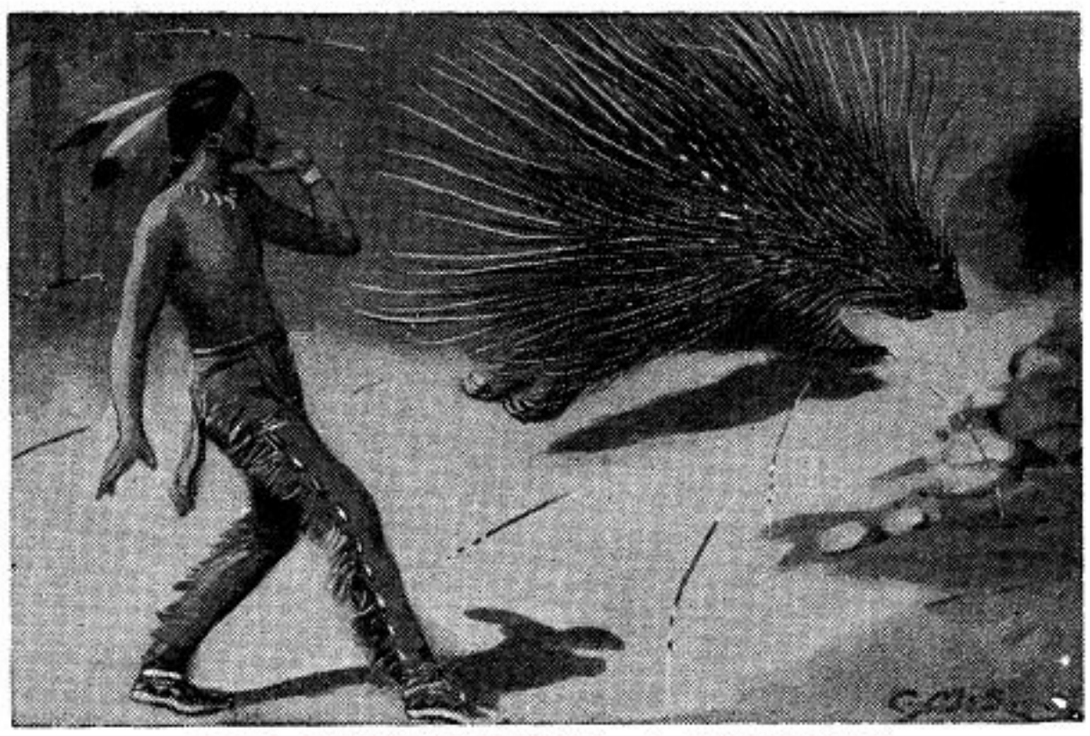
ONE misty summer's morning two Indian braves came slowly over the mountains carrying a wounded comrade on a litter.

By and by they laid it on the ground, and sat down to rest a little way off, talking in sullen whispers. This accident had spoiled their hunting expedition; it was weary work bearing the youth all this long way back to camp. Presently they took up the burden again, and, marching with it to the edge of a narrow cleft in the rocks, they suddenly flung the litter down it.

At first the wounded youth was stunned by the fall, but when he came to his senses he ardently wished that his neck had been broken. How much more dreadful it would be to starve to death in this pit!

All at once he heard footsteps close at hand. Looking up, the youth perceived that an old man was coming slowly toward him in the fast-gathering twilight.

"My son," said the ancient stranger, "I have been examining your injuries. They are great. I can cure them, but I make this condition—when you are well you must go hunting for me, as I am too feeble to go."



THE HERMIT BECAME A PORCUPINE

The youth was only too thankful to accept these terms, and could not thank his deliverer enough.

The old man was skilful in the use of medicine; before long the youth recovered. All day he spent in hunting, and would have been quite content if he had not thought of his mother, who would be mourning him as dead.

One day he killed a bear, and was bending over his prey when he heard a rushing sound in the air. Looking up he beheld three beautiful beings whose feet did not touch the ground. Their limbs shone like gold through the thin, rainbow-coloured garments which fluttered about them, and their faces were as bright as stars.

The brave fell on his knees.

"O, Indian," they said, "we are the Thunderers. It is our task to watch over the Earth, to foster the good, and to drive out evil spirits. We have come to you to seek your alliance."

"How can I serve such mighty ones?" asked the youth. "I will do whatever you command."

One of the Thunderers replied: "Then we will take you back to your mother's lodge. Know that the old hermit whose huntsman you are is really an evil spirit in disguise. For fear of us he hides in that cavern where we cannot reach him. Your task is to draw him out into the open."

The youth leapt to his feet and hurried back to the cave.

"I have killed a fine bear," he said, "but it is much too heavy for one man to drag. You must help me to bring it in."

The old man frowned and sighed. He was silent. Then he asked:

"Are there any clouds about?"

The youth said there were none, and the hermit followed him unwillingly. When they reached the dead bear the old man lifted it on his back, and set off for home with great strides.

But a little black cloud suddenly appeared in the midst of the blue sky. In a moment or two it had grown to a gigantic size. There was a flicker of lightning, a roar like the falling of mountains, and a thunderbolt was suddenly hurled in the direction of the old man.

He dropped the burden and fled. A second thunderbolt was flung, and the venerable hermit became a porcupine as big as a calf, which ran along shooting out a shower of quills like arrows. As he was gaining the cave a third thunderbolt fell, and this time the aim was perfect. The monster rolled into the cavern dead.

Then the clouds parted, and the Thunderers appeared before the trembling Indian. Two of them took him between them, with his arms about their necks, and bore him swiftly over the hill and forest to his mother's feet.

THE IDOL AND THE WHALE

AMONG the trees of Kamakura there sits an enormous bronze Buddha.

He is fifty feet high, and ninety-seven feet round about; his face is eight feet long and the girth of his thumbs is three feet. There he sits, smiling gently to himself as though he remembered the fine times of the Middle Ages, when Kamakura was a capital city and he lived in a temple, instead of having no roof but the sky over his mighty head.

All this is a matter of fact. But we are not prepared to say quite as much for the story of his encounter with the whale.

The whale was a monster among his kind, and he took as much pride in his bulk as soldiers take in their medals, or as some queer folk seem to take in their ailments. Others might be more beautiful, more clever, more useful to the community, but no one was as big, and somehow he felt that this gave him a kind of kingship over his fellow citizens of the water. He patronised them all; yet, as he was good-natured, they put up with his airs and graces.

One day some fishermen gossiped about the bronze Buddha while they were at sea. They spoke of the scores of pilgrims who flocked to Kamakura because of the image, which, they said, was *the biggest thing in the world*. They were overheard, and of course some little busybody of a sprat must needs fly off to tell the whale.

At first the monster roared with laughter, and made several tidal waves. Nothing could be as big as he was. But by-and-by he began to grow jealous. He would have liked pilgrims to make journeys to see *him*. He took a dislike to the Buddha; he brooded, he sulked; at last he began to fear that the image might really be bigger than he was, and at that he flew into a passion like a naughty baby, dashing about the sea, churning up the foam, and blowing water spouts through his nose till all the other ocean people were dizzy.

When he was forced to pause for breath an elderly shark approached him cautiously, and asked what was the matter. The whale poured out his cares.

"Don't meet trouble half-way," said the shark, "you may still be the biggest thing there is. Wait here quietly, and I will find out if these rumours are true."

The shark swam to the coast, and there he saw a rat cleaning his whiskers as he sat on a junk in the sunlight. He was an obliging little beast, and agreed to go inland and measure the idol.

When he returned to the shark he was quaking all over. Never in his life, he said, had he seen anything so immense as the bronze Buddha. He had plucked up courage to crawl round the base of it, and it was five thousand paces.

The whale could hardly believe the shark's message. Rest and happiness were no longer possible to him. He decided that he must see the Buddha for himself, and settle his mortifying doubts once for all. Tradition says that he borrowed a pair of magic boots so as to be able to travel over land, though how he wore them it is difficult to imagine. Thus equipped, he set out for Kamakura without delay.

He arrived at night, which was fortunate, or the population would have died of terror. There was no mistaking the great temple. He knocked on the door.

A voice that rang like a mighty bell bade him enter.

"Pray come out to me," replied the whale.

There was the sound of heavy footsteps, the doors opened, and a vast figure appeared towering under the stars.

At first the two immense beings were so amazed at the sight of each other that they could not speak. But the whale presently began to tell his story.

The sound of voices woke a priest who had fallen asleep over his vigil in the temple. He saw the idol's pedestal empty; he rushed out, and, beholding the colossal pair, fell upon his face with a scream. But the Buddha picked him up, and bade him take their measurements with his rosary.

The whale's heart almost cracked with suspense, and the priest thought that his master's beautiful face did not look quite so calm as usual in the moonlight.

At last the priest said, "The whale is taller by two inches."

There is no need to add that the whale lived happily ever after. Really, in spite of his conceit, we must be glad he did not lose, for the consequences might have been so dreadful. As for the Buddha's feelings, if we may judge by his expression today, his defeat did not rankle very long.

HOW MR. CAT BECAME KING

ONE morning Mr. Cat found himself without a home. He had been living for years with an old man in a fine house on the edge of the forest. But the old man died at last of old age, and the house was bought by a woman who did not like cats. She had a dog, and this dog would never let Mr. Cat enter the house.

So Mr. Cat set out to explore the forest, and he found a little empty hut in a valley which he thought would suit him. Here he lived for some time, and no one disturbed him; and, though he did not get much food, he managed to keep well and active. One afternoon he was strolling down to the stream for a drink when he met one of the daughters of Brer Fox. She had never seen a cat before, and she looked at Mr. Cat with great interest.

"Who are you, and what is your name?" said Sis Fox. "And what are you doing in this forest?"

Mr. Cat looked very important.

"I have come from town," he said very grandly, "to govern this forest and to keep all the animals in order. I am a cat, and, as of course you know, the cat is the king of beasts."

"Oh," said Sis Fox, "I wish you would come and have dinner with me!"

Mr. Cat had not found anything to eat that day, and he accepted the invitation. And during the dinner Sis Fox said: "My lord, are you married or single?"

"I am a bachelor," said Mr. Cat, stroking his whiskers with his paw in a knowing way.

"And I also am single," said Sis Fox. "Would you like to marry me?"

Mr. Cat, he agreed to this, and the wedding took place with a great deal of ceremony. But at the request of Mr. Cat none of the big animals was invited.

The morning after the marriage Mr. Cat said to his wife: "Sis, I am already growing thin with hunger. Go and get me a good dinner."

Away went Sis Fox, and while she was hunting she met Mr. Wolf.

"My dear little sister," said Mr. Wolf, "I have not seen you for days! What ever have you been doing with yourself?"

"I have been getting married," said Sis Fox. "I am now the wife of the governor of the whole of this forest."

"What! You married?" said Mr. Wolf, starting back in surprise. "I must go and call on your husband."

"Very well," said Sis Fox. "But I must warn you that he is an absolutely terrible creature. Before he sees you you must try to win his favour by some gift. Bring him a nice young fat lamb. Leave it at the door, and run away and hide yourself, or he will surely devour you."

Mr. Wolf was rather frightened, and he scuttled off to fetch a lamb for Mr. Cat. Sis Fox went on her way, and in turning a corner she met gruff old Mr. Bear.

"Good-day, my pretty friend," said Mr. Bear. "Where do you come from?"

"From my husband's house," she replied. "I have just married the governor of the forest."

"Really!" exclaimed Mr. Bear. "I must go and call on him."

"Certainly," said Sis Fox. "But my husband has a distressing habit of devouring every animal he does not like. Go and find a bullock, and bring it to him as a gift. Mr. Wolf is bringing a lamb."

The bear shuffled off and got a bullock, and on his way he met Mr. Wolf carrying a lamb.

"Hallo, Mr. Bear!" said Mr. Wolf. "Where are you going?"

"To the governor of the forest, who has married Brer Fox's daughter," said Mr. Bear. "I am taking this bullock to him."

"And I this lamb," said Mr. Wolf. "I understand he is absolutely terrible."

The two animals came together to the hut in which Mr. Cat lived.

"Go and knock at the door," said Mr. Wolf to Mr. Bear.

"I am afraid," said Mr. Bear. "You go and do it."

"I daren't," said Mr. Wolf. "But here is Brer Hare. He will go for us."

Brer Hare had come for a drink at the stream in the valley, and the two big animals asked him to knock at the door of the hut for them. He did so. Mr. Wolf, he hid himself under a bush; and Mr. Bear, he climbed up a tree.

The door of the hut opened, and Mr. Cat and his wife came out.

"He is a very small creature," said Mr. Wolf to Mr. Bear.

"Yes," said Mr. Bear, rapidly climbing down the tree, "he is remarkably small."

He looked at Mr. Cat with scorn, but Mr. Cat leapt on the bullock, and looked it over, and said in an angry voice to his wife: "This is very little! Who has dared to make me so paltry a gift?"

Mr. Bear drew back in surprise, and scrambled again up the tree and said to Mr. Wolf :

" He is so small, and yet he has such an appetite. Why, a bullock is a good meal for four grown-up bears ! This husband of Sis Fox is really a terrible creature."

Mr. Wolf, hidden under the bush, began to tremble. Mr. Cat heard a slight noise among the leaves. Thinking that a mouse was stirring there, he sprang forward, and his claws scratched the muzzle of poor Mr. Wolf. Mr. Wolf yelped, thinking he was going to be devoured ; and, backing out of the bush, he fled away as fast as his 'egs would carry him.

But Mr. Cat had seen him, and, fearing that Mr. Wolf would attack him, he scrambled up the lowest branch of the tree.

" Oh," said Mr. Bear, " the terrible creature has seen me ! He has seen me, and he is climbing up here, and he is going to devour me ! "

Down he came from the tree, and away he went after Mr. Wolf. And all the time the wife of Mr. Cat kept on screaming : " My husband will devour you ! My husband will devour you ! "

Mr. Bear and Mr. Wolf were well-nigh terrified out of their lives, and they went about the forest relating their awful adventures to all the other animals, and all the other animals grew horribly afraid of their new governor. But Mr. Cat and his wife were very happy, for they had an abundance of food to eat. Presents were heaped up every morning at the door of their little hut.

THE WITCH'S RING

A MILLER of Mayfield had three sons, who all fell in love with the same girl. Her name was Marjorie, and she was the daughter of a farmer at Rotherfield, and the prettiest maiden in Sussex. But a rich old miser who lived in the village began to court her, and the farmer favoured his suit and kept the miller's sons away.

At last Richard, the eldest son, determined to propose to Marjorie before the miser won her. On his way to the farm he met Mad Molly. She was an old, feeble woman, suspected of being a witch.

" Good-day, my son," said Mad Molly. " Where are you going this morning ? "

Richard hurried on without replying. On reaching the farm he blurted out a proposal of marriage, but Marjorie only laughed at him.

Rowland, the second son, then tried his luck. He also met Mad Molly and hurried on without answering her, and he, also, returned in a downcast mood. Then Robin, the youngest boy, went to the farm. But he set out without hope. He was a strong, clever, and gentle lad, but he had a very long nose, and this, as he knew, made him look ridiculous. When Mad Molly asked him where he was going, he said :

" On a hopeless errand, Granny. I am about to call on Marjorie and ask her to be my wife."

" And your wife she shall be," said Mad Molly. " Look at this ring, my son. Put it on your finger and say Bless it ! "

Robin did so, and his nose grew half an inch shorter, and he became a very handsome youth.

" Now," said Mad Molly, " if Marjorie refuses you give her the ring to wear. Then every time you say Drat it ! her pretty nose will grow half an inch longer, and she will become ugly, and be very glad to marry you. Then you have only to say Bless it ! and her nose will grow shorter and she will recover her beauty."

Robin ran to the farmhouse, and, as Marjorie was out, he sat in a chair and closed his eyes. Just then the miser entered, and saw the ring on his finger.

" An engagement ring ! " he said. " I'll keep that."

He pulled it off Robin's finger and put it on his own. But Robin was awake, and he began to whisper " Drat it ! Drat it ! " and as he said these words the miser's nose grew longer and longer.

" Something is stinging me ! " cried the miser, running off to a doctor. " My nose is swelling frightfully ! "

Happily, Robin did not want his ring any more. Marjorie was surprised to see how handsome he looked. She had always liked him for his gentleness, and she now fell quite in love with him, and agreed to marry him as soon as he got a farm.

" Return my ring and I'll cure you for one thousand pounds," said Robin to the miser when he came back.

The miser at last did so, and Robin and Marjorie then married and bought a farm, and lived there very happily together.

THE MAN WHO GAVE AWAY

ONCE upon a time there was a man who lived with one old servant in a little cottage in the country. He had no wife and no children; all his brothers and sisters were dead; except the old woman who looked after his cottage, made his bed, and cooked his meals, there was no one to be fond of this solitary man.

But he was not unhappy. He had a dog called Don, the faithful companion of all his walks. His study was full of beautiful books, which he read with delight. His little garden was bright and fragrant all the year round with flowers, which he cared for himself and loved very dearly. And in the winter he spread breadcrumbs on his window-sill, and robins learned to come into his house and even to eat food from his hand.

HE PASSED A WORKMAN WITH HIS FAMILY TRUDGING PATIENTLY ALONG IN SEARCH OF WORK

And yet he felt that something was lacking in his life. There was something he needed; he could not tell what it was, but something that would complete his simple happiness and fill his quiet life with content. He used to sit quite still at night wondering what this mysterious something could be.

One winter's afternoon, when he was walking through the snow in a lonely country lane with Don, he passed a workman and his wife and their little family, trudging patiently along in search of work. The man carried a little girl in his arms; the woman pushed a shabby baby-carriage, which was full of old clothes; two boys and a girl lagged behind, footsore and tired.

When they had passed, the solitary man said to himself: "I ought to have given them a few coppers; they are very poor. Dear me, it was foolish of me not to have thought of it at the time. Three or four coppers would have made a world of difference to those poor people."

That night he could not sleep for a long time. In the darkness of his bedroom, where a comfortable fire was just beginning to die down, he saw the picture of the workman's family—the little shabby and tired procession of human beings, trudging wearily through the snow.

"Dear me," he kept muttering, "a few pence would have made all the difference to those poor people."

On the next day he unchained Don from the kennel, and started out with the hope of meeting the poor people.

But he met no one at all.

That night he was really very unhappy. He could not read, he could not write, he could not do anything but sit and think how unhappy he was because he had met no poor people.

"Tomorrow," he said, "I will not walk in the lanes, but in the high-road, and there I shall surely meet some poor people who will be glad of a few pence. I shall never be happy unless I can make other people happy too."

The next day he walked on the high-road, and very soon he met a family of poor people, tramping wearily along in search of work. Don barked at them, and his master called him away.

"I don't wonder the dog barks at us," said the labourer bitterly; "for we look more like tramps than respectable people."

The gentleman saw what a fine-looking man was this poor labourer, and he saw, too, how cold and hungry looked the children. It struck him that pence would not be enough. He must give them a shilling. He put his hand in his pocket and drew out half-a-crown.

"There," he said, "take that—it will help you along the road perhaps."

The workman stared open-eyed at the half-crown, and then, with a bright smile, he exclaimed joyfully: "I feel a new man!" He thanked the giver, and passed on.

"Dear me," said the gentleman, "I ought to have given him five shillings. Those little children looked very hungry."

He felt unhappy until he met a young widow carrying a child in her arms and leading another by the hand.

"Would five shillings help you along the road?" asked the gentleman.

The woman's face, which had been grey and sad, became glad and animated.

"Five shillings!" she exclaimed. "Why, five shillings is heaven!"

"There," said he; "I hope it will make you happy."

"It has made a new woman of me," said the poor widow, staring.

A feeling of great pleasure took possession of the gentleman's heart. "How easy it is," he said that night, "to make oneself extremely happy. I have spent seven shillings and sixpence today, and really I never bought anything in my life that gave me so much pleasure."

Life seemed to him now a much happier matter. He still had his books, his robins, his flowers, and his faithful dog; but in addition to those he had a little secret of happiness all to himself.

"Really," he said, when he woke up, "I feel a new man myself."

As he was shaving he suddenly stopped, lowered the razor, and looked at his lathered face in the glass. "If silver can make poor people so wonderfully happy, what would gold do?" he thought. The idea filled him with pleasure.

From that day on this gentleman, who was not so very old and not very rich, made long walks into the country, and whenever he saw poor people he took half a sovereign from his pocket, and said to them: "That will help you to feel the sun is still shining." They would call after him, "God bless you, sir!" astonished by his gifts; and those blessings of the poor became the chief happiness of this once solitary man.

He lived to be an old man, and when he could not walk long distances he bought a basket-carriage and a pony, and drove himself along the roads, particularly in wet and cold weather, with a pocket full of half-sovereigns.

His old servant would say to him:

"Why, master, what for do you want to go out driving on such an ugly day as this? Why, I wouldn't turn a dog out on such an ugly, nasty day!"

"Oh, come," he would say, "a little wind and rain is good for the complexion; I want to keep young, Betty; I want to keep young as long as I can."

His face brightened just before his death. "What a lot of poor people!" he exclaimed. "Dear me, what a lot of poor people!" No doubt all those poor people had come to cheer his spirit on its way with a thankful "God bless you!"

THE WANDERING SHEPHERDESS

In the days of King George the Third all the beaux of Exeter vainly waited for a sign of love from Maria Selwyn, the gentle, beautiful heiress of Squire Selwyn. But Maria had already given her heart to a handsome shepherd, and she used to steal out at dawn and meet him in the silent meadows.

But one unhappy morning the old Squire also rose early, and he saw the two lovers sitting together under a thorn. The sight drove him mad with anger, and he had the shepherd lad attacked, and the next morning Maria found her sweetheart nigh to death.

"All I have in the world, dearest, are my sheep. I leave them to you. They shall follow you," he said, as he died.

The girl was crazed with grief. Her father shut her up and hunted the sheep away; but she got out of the house, and began to wander aimlessly about England, and the sheep followed her.

She at last crossed the Scottish border with her strange flock, and she perished on the wild moors near Kingswell. Her sheep then would neither eat nor budge. They pined away, and some kindly Scottish peasants buried them around their mistress.

THE KNIGHT'S TEN THOUSAND JEWELS

A JAPANESE knight was once walking near the shore when he was amazed to see a hideous monster creeping inland.

He drew his sword, but the creature turned its eyes on him meekly, and made no show of resistance.

"What are you?" cried the knight.

"My name is Samébito," replied the creature. "I have been exiled because the Dragon King of the Sea is angry with me. On land I shall soon perish, even if you do not kill me."

The knight was moved to pity. He took the monster home, and let it live in a lake fringed with lilies and graceful trees. Every day the knight fed it with freshly-caught fish.

All went well till the man fell in love with a beautiful damsel who vowed she would not marry him unless he gave her ten thousand jewels. Even if he sold his land and his armour, his house and his furniture, the unfortunate knight would not be able to make her such a present.

He went to bed, turned his face to the wall, and lay there without tasting food or water, for he no longer cared to live.

Samébito could not understand what had become of his master. At length he crept out of the water and drew his long scaly body into the house. The knight turned his head and murmured faintly:

"Alas, Samébito, we must part for ever, for I am dying."

At these words the monster burst into tears. And lo, every tear was a ruby!

The knight leapt out of bed, and began to pick up the jewels with exclamations of wonder and delight.

"You have saved me, Samébito!" he cried. Then his face fell, for he saw that there were not ten thousand jewels yet.

"Please weep again," he asked.

Samébito was indignant.

"I cannot weep at will," the monster exclaimed. "My tears welled up from the anguish of my heart. Now you are well I sorrow no longer."

However, when the knight explained his difficulty, the ruffled monster became pensive. After remaining for a moment deep in thought he said:

"Take me to the sea, and perhaps as I gaze at my old home I shall grow mournful and weep."

So they brought a large wagon, and drove the monster to the sea. He had not contemplated the blue ocean for long before the precious tears began to ooze from his sad eyes. There was soon quite a mound of jewels, and the knight could hardly contain his exultation.

Suddenly a voice cried from the sea:

"Samébito! You are pardoned. You may return."

The two friends took a tender farewell, and parted, one for his bride, the other for his native sea.

HOW THE THIEF WAS FOUND OUT

MOSTAFA, a wise and rich merchant of Damascus, had an only son, Said, whom he wished to train up in prudence; but Said trusted too much in a young Armenian, who managed to cheat him several times without in any way raising his suspicions.

One day Mostafa and Said were compelled to go on business to Bagdad.

"Now, who can I trust all my money with during our absence?" said the merchant.

"With my friend the Armenian, of course," said his son. "He is the most honest man in Damascus."

"Very well, Said," replied the merchant. "For once I will rely upon your judgment."

He gave his son a large, heavy strong-box to entrust to the keeping of the Armenian, and when Said returned he took him to Bagdad. Two months afterwards they returned to Damascus, having made a considerable amount of money out of the business they had done.

"Now, my son," said Mostafa, "go to your friend and get my strong-box."

Said went to the Armenian, and quickly returned in great anger.

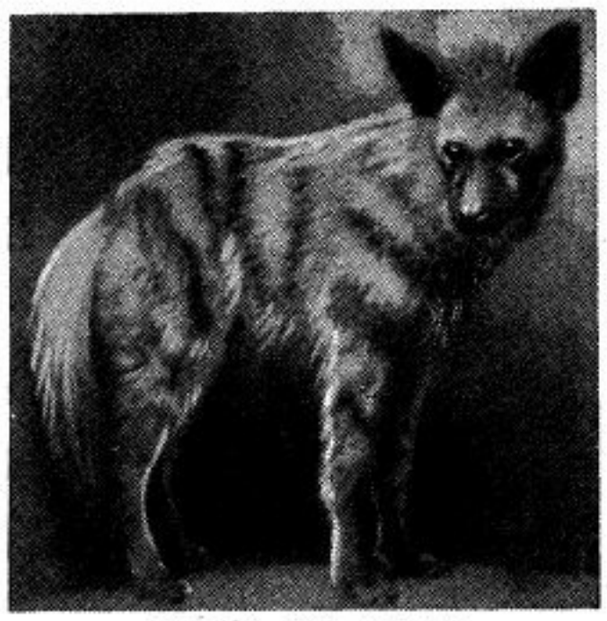
"You have insulted my friend," he exclaimed. "It was not money you entrusted to his safe keeping, he says, but a mass of broken stones!"

"Pray, how did your very honourable friend find that there were only stones in my strong-box?" said Mostafa. "He must have broken the three locks, and this, I think, will now prove to you that it was well I entrusted him with nothing of any value.'

Said hung his head, and thenceforward he allowed himself to be guided in his judgment of mankind by his father's wisdom and experience.

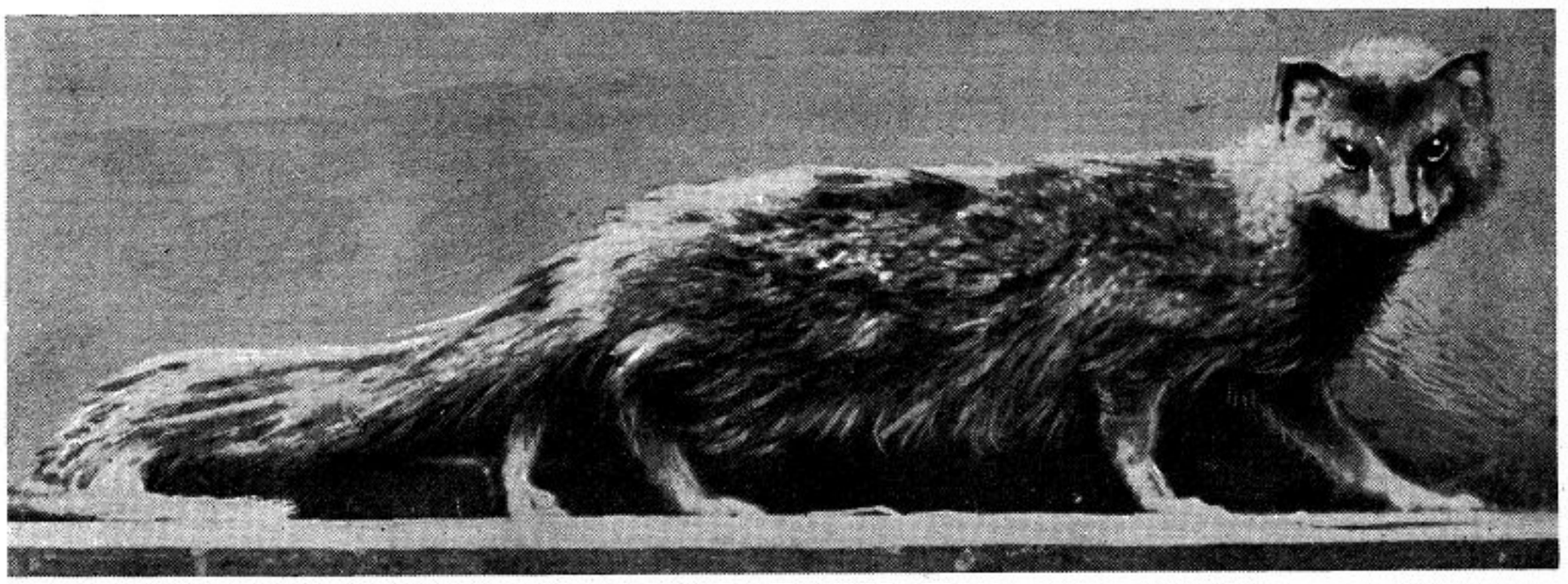
EIGHT COUSINS OF PUSSY-BY-THE-FIRE

THE TIGERINE CAT

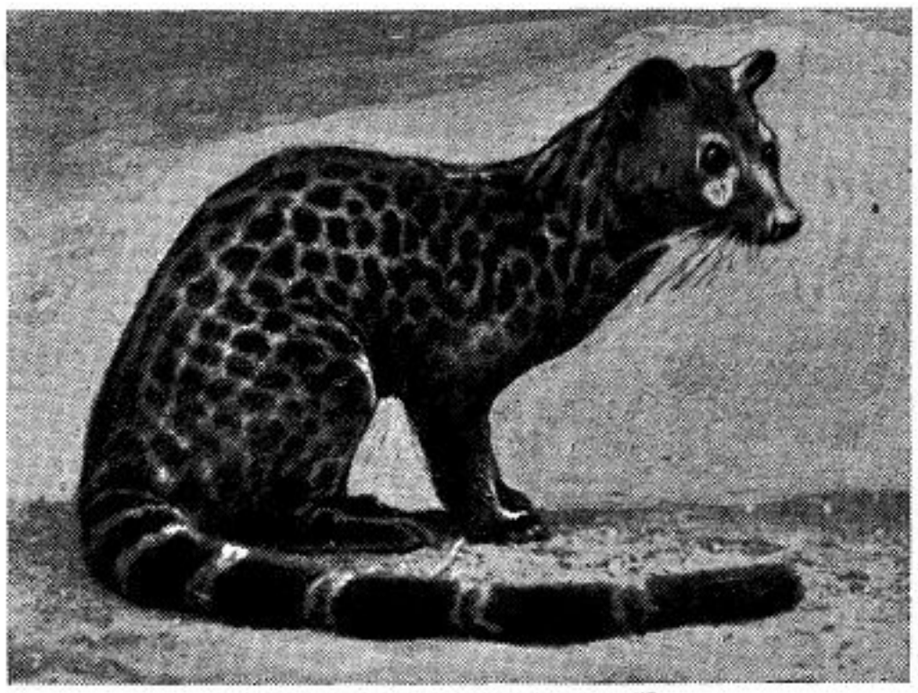


THE AARD-WOLF

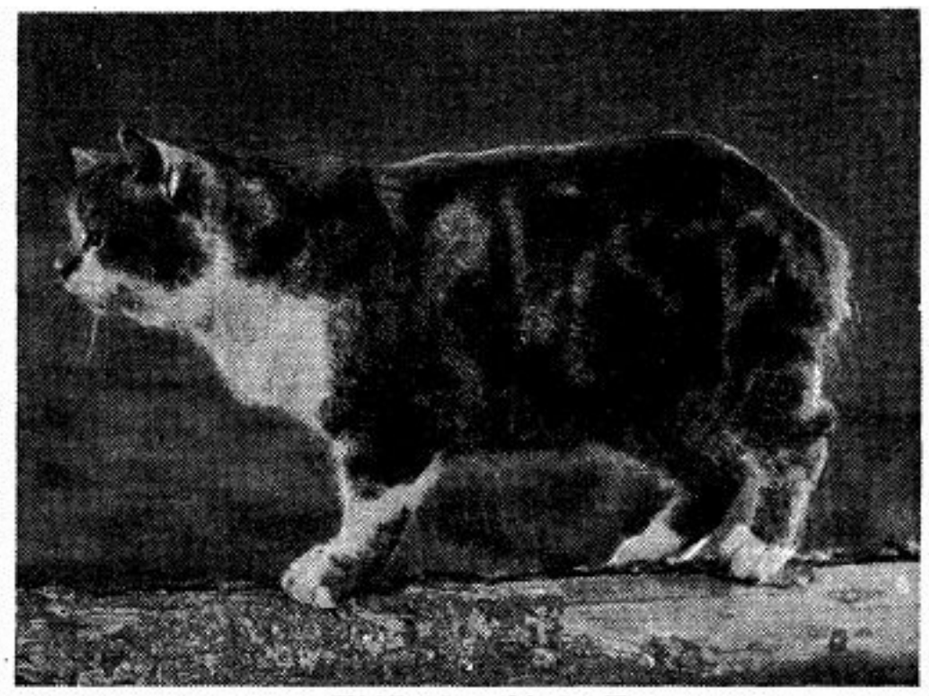
THE OCELOT



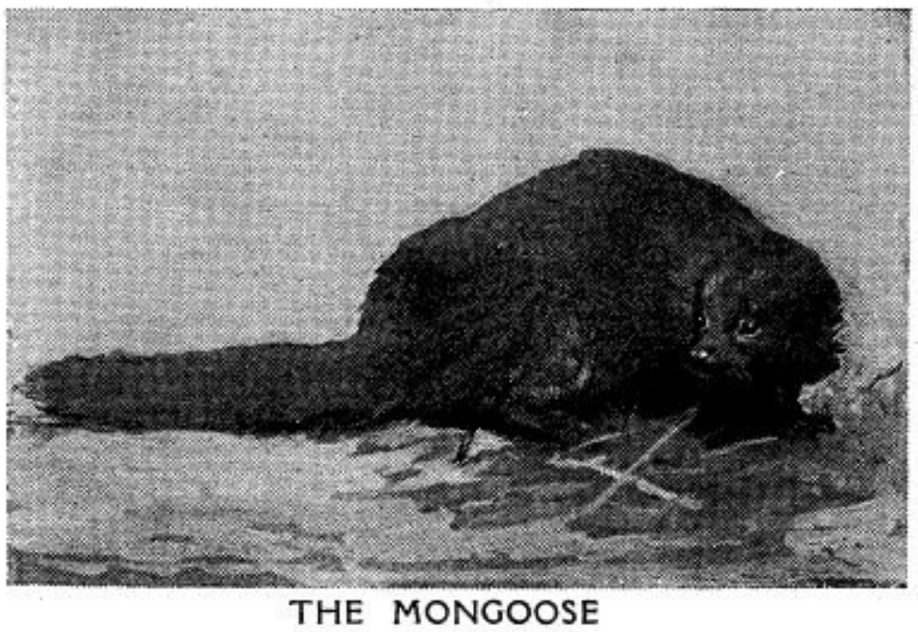
THE MEERKAT AT ATTENTION



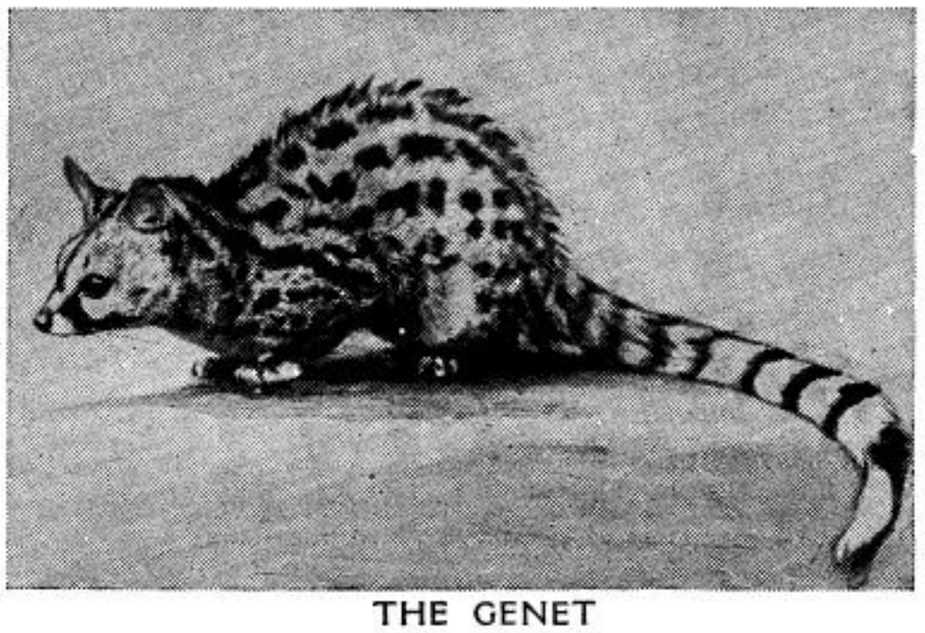
WATERHOUSE'S GENET



THE MANX CAT

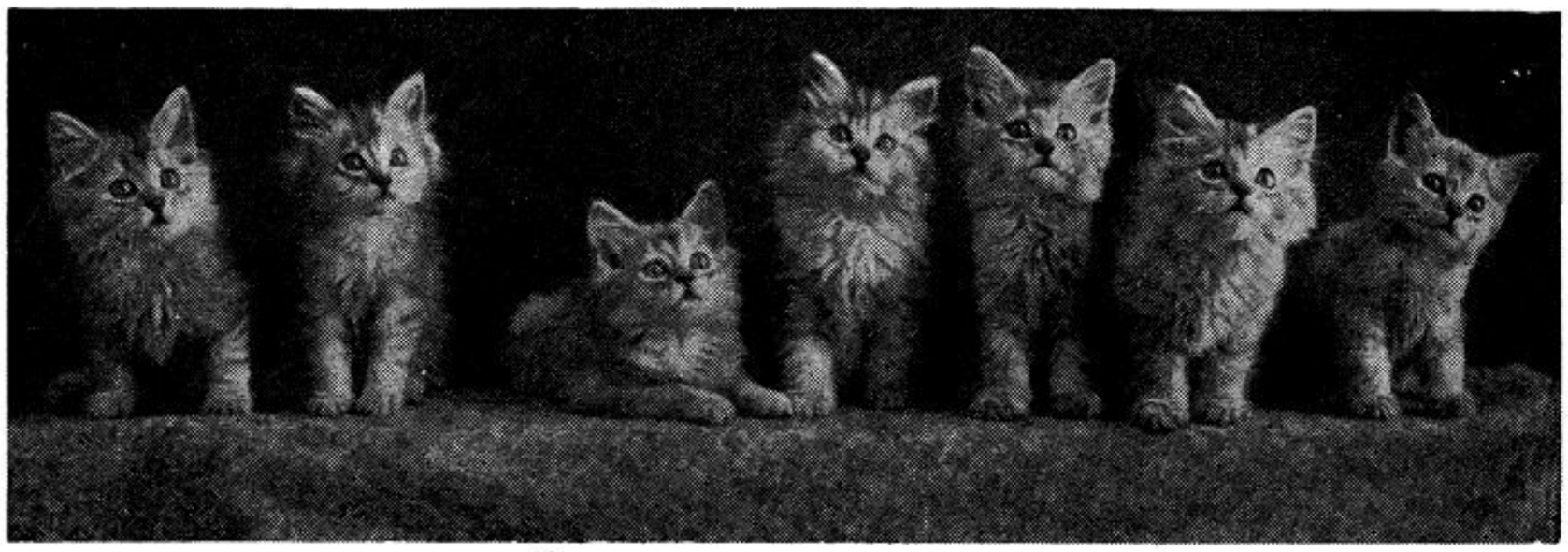


THE MONGOOSE



THE GENET

The photographs on these pages are by Messrs. Gambier Bolton, W. S. Berridge, C. Reid, Alfieri, and W. P. Dando.



BIG CATS AND LITTLE CATS

IT is a disturbing and terrible thought that one of the most magnificent orders in the scale of Nature lives by unceasing slaughter. For fierce and insolent beauty, for grace, strength, speed, and audacity there is no living thing to excel the animals that feed on flesh.

Long process of refining of wits, of sharpening of natural weapons, has brought these Carnivores—so they are called—to the highest pitch of efficiency in the capture and killing of other animals.

Day and night the Carnivora are playing their appointed part in keeping down numbers. They themselves are without visible foes, yet have a mysterious check on over-multiplication. All the flesh-eaters are more numerous at a birth than the herb-eaters. But an unseen agency takes off cubs from every nursery, or the flesh-eaters would be too numerous, and would destroy all herb-eaters.

Check and counter-check are constantly at work to maintain the balance, and as for the terrors of it all—they hardly exist! The deer and antelope tribes, the stock source of the flesh-eaters' meals, are possibly the happiest things in dumb creation. They are born with a sense of caution in the presence of lions, leopards, and tigers, as emphatic as their instinct to find food and water and mates.

The conditions of jungle and plain and forest are not more frightful to animals than the traffic dangers of Hyde Park Corner to a Londoner, born to elude such perils. We must imagine that a cheery gazelle is not more worried by the possibility of an encounter with a lion than we are by the possibilities of motor-buses, wasp-stings, and bites from the mad dogs we may never meet.

The Strand or Trafalgar Square would be more horrifying to a lion or an antelope than the jungle or the forest to us. Life is anxious, full of responsibilities to all that inherit. Humanity has to cross Ludgate Circus in the high tide of traffic, and to confront the viper in the wilds; yet it is happy, unquailing. The eland approaches its Ludgate Circus when a lion is near; a gazelle must avoid its wasp-sting when a hyena lurches at it. The balance is on the side of escape and happiness for the great majority, human and animal.

Freed from any challenge from animals, the cats are the necessary tyrants of the world, by right of might. Like the other carnivores, they have claws, not nails, and teeth which tear and chop or shear like scissors, but do not masticate. Lion, tiger, leopard, lynx, the domestic pet on the hearth—they are all cats, with the lion at the head of the family as the king of beasts, at home in Africa and Persia, but now almost extinct in India.

The majestic appearance of the male lion is crowned by a great mane, sometimes black, but always darker than the tawny skin. Added to that it has the most

stupendous voice in nature ; its ground-shaking roars unnerve animals so that they are incapable of flight.

This is its armament : teeth which can crush at one bite the bones of a buffalo's, an eland's, or a zebra's neck ; claws like grapnels of yellow horn, which can hold a horse from its gallop and strip the flesh from its flanks ; a gape which admits a man's head into its mouth ; strength which enables it to leap a fence when hauling a dead bullock in its mouth ; speed which makes it, for a short distance, a kind of flesh-and-bone thunderbolt.

Although it is called the king of beasts it is really less formidable than the tiger, which has greater strength of jaws and claws. Yet the lion is sufficiently terrible. As a rule, it does not attack man ; now and then it eats only human flesh ; sometimes it takes man or beast by turns.

THE LIONS THAT CREPT OUT OF THE JUNGLE NIGHT BY NIGHT

One which entered the camp of Mr. J. G. Millais had previously eaten six native women, but on leaping into the enclosure it struck not at men, but at a donkey, five yards from the fire. The donkey fell dead, and two others, tethered near, broke their ropes and fled. The lion bounded after them and killed first one, then the other, and lay down to eat the third.

The two most notorious lions in all African history began their public career by raiding the sheep and goats collected for the workers who were building the Uganda Railway. Then they invaded the camp of men at Tsavo, and for nine months caused a reign of terror there. Night after night they crept from the jungle into the little city of tents ; night after night each carried off a man. As darkness fell, the beasts would be heard roaring in the forest. Silence would follow, then a cry of anguish would ring out, " Beware, brothers ; Satan is here," and all knew that another poor native had gone to make a ravening lion's supper.

The resources of the British Empire were behind the building of that railway, but the slaughter by these two lions became so terrible that at last panic paralysed the undertaking, and all work ceased for about a month. Finally Colonel Patterson shot the two brutes, and the line again marched forward.

Conditions such as those are often brought about by tigers in the domestic life of India, where one animal may kill over a hundred people in a year as the people go at night to draw water from a well. A white man arrives and kills the tiger, but another creature of the same species is certain to appear in the old beat, and the remnants of a village population, terrorised beyond endurance, flee at last.

THE TIGERS AND LEOPARDS, AND THE TERRIBLE WORK THEY DO

The giants of the tiger tribe live in Manchuria, monsters, huge of bone and muscle, long of fur, at home in the snow and rigours of a bitter climate ; but the Indian tiger is full lion size—ten feet long and up to 550 pounds in weight. With its ability to live in swamps, in reeds, grasses, in caves and clefts of rocks, in old buildings and deserted cities, it has a wider range than the lion, and is the foremost death-dealer among Indian animals. What the casualty list is in Africa no man knows, but in India tigers kill about 800 people every year, to say nothing of all the thousands of domestic cattle.

Next to the tigers come the leopards, the second animal scourge of India. Some 5000 leopards are every year disposed of there, but the animals kill on an average 350 of our Indian fellow citizens in the same time. In a sense leopards are more to be feared than lions and tigers, for, while these two cannot climb trees, leopards climb superbly, either to catch a fugitive or to lurk in hiding ready to pounce down on one. In Africa the leopard is viewed with special abhorrence for this reason. All these great cats are extremely difficult to kill. If dying animals do not feel the pain inflicted by the big cats, the big cats seem to experience none themselves.

THE LION THAT KILLED A FAMOUS STATESMAN'S BROTHER

The lion which killed the brother of Viscount Grey was first shot through the right shoulder, then through the lower jaw, then through the body, and finally through the heart. Between the second and third shots it charged home at Mr. Grey, and bit him frightfully. After the third shot it turned on him again, and with its damaged lower jaw " worried him as a dog worries a rat," as the unhappy man's friend said. The last of the four shots, all fired at close range, was fatal ; but so were Mr. Grey's wounds.

Now in the presence of these horrors, it is consoling to find that Mr. Grey was

able to assure those about him that he felt no pain. He did not suffer at all; shock and loss of blood, not agony, caused his death. Sir Edward Bradford had his left arm munched away up to the elbow by a tiger, and sat at dinner one night with Rustem Pasha, who had lost his right hand and left arm to a bear. Both men were able to say that they had no suffering during the mutilation. They agreed that probably their intense desire to defend themselves prevented them from feeling the pain.

THE LION WHICH SHAKES A MAN AS A CAT SHAKES A MOUSE

Dr. Livingstone, who was terribly bitten by a lion in Africa, had a different and deeply significant theory. The shock, said he, produced a stupor, similar to that which seems to be felt by a mouse after the first shake by a cat. It caused a sort of dreaminess, in which there was complete consciousness of what was happening, but no sense of pain, no feeling of terror. It annihilated fear, and allowed no sense of horror in looking round at the beast. This peculiar state, Livingstone urges, is "probably produced in all animals killed by the Carnivora, and, if so, is a merciful provision by our benevolent Creator for lessening the pain of death."

There is comfort in that thought as we consider the daily lives of this splendid but pitiless order of flesh-eaters, animals which would perish within a week if other animals were not available as food.

Lion, tiger, leopard we have named, but a special type of leopard must be added—the ounce, or snow leopard, which haunts the towering Himalayas. In summer it ranges up to 18,000 feet, lithe and formidable at a height where a man is so exhausted that he thinks twice before undergoing the exertion of turning over in bed. There this redoubtable great cat lives, never coming lower than 6000 feet.

THE PUMA THAT WILL ONLY ATTACK A MAN TO SAVE ITSELF

So far we have kept to the Old World, but now we must cross to the New, where we find no lions or tigers but interesting parallels. The American jaguar is a big leopard, with huge, powerful limbs, decorated with rosettes instead of spots like its Old World cousin; an accomplished swimmer and climber, a deadly foe to cattle and horses, and as ready to kill an unarmed man as to look at him. The jaguar slays an ox, and drags it lightly into hiding; he revels in horse flesh of his own procuring.

America's lion is the puma, which, if men were not there to dispute its path to progress, ought to have a future, and for this reason that the more varied an animal's diet, the greater that animal's success in life. The puma eats anything, from a pig to a porcupine, from a horse to a snail, from a sheep to a bullock. It is a terrible scourge to ranches, and in olden days exterminated the half-wild horses which roamed free in Patagonia.

The one thing in its favour is that in no circumstances will it attack man unless it has to fight him to save its own life. The tradition is persistent that it will do battle with the jaguar in defence of the man whom the jaguar seeks to assail.

THE FASTEST SHORT-DISTANCE RUNNER IN THE WHOLE ANIMAL KINGDOM

Prosperity has attended the campaign waged by teeth and claws, and abundant species have arisen to carry on in lesser ways the tradition of the giants. There is one beast, called the clouded leopard, which is as much a tree-dweller as a sloth. The lynx and the caracal are also cats. Then we launch into a world of lesser cats; the golden cat of the Indo-Malay area, which has a grey Chinese cousin; the fishing cat which truly catches fish, but little children and hosts of animals as well; the leopard cat, the serval, the tiger cat, the eyra, a weasel-like type; the Egyptian or Kaffir cat, from which our own puss is believed to descend; all these and more, including the fine old wild cat of Britain, stupid and untamable up in its last retreat, the Highland deer forests, come into the cat family. Each one is Destiny to some order of grass-feeders.

There are others, and we must note the cheetah, more cat than dog, yet not quite cat either, a leopard-like beast with claws resembling a dog's, and therefore not capable of freely working in and out of their sheaths. This animal is remarkable as the one which is caught young and trained to hunt like a dog, its quarry being the swift deer of India. A cheetah runs down the fleetest of grass-feeders, and is regarded as the fastest of all runners for any distance up to about 400 yards.

The cheetah and the domestic cat are the only animals from the feline group that we

have brought home with us from the wilds, but our puss shows what man's selective care can do. Arising from a common stock, we have dozens of breeds of pet cats.

It is a wonderful choice—white, black, blue, cream, tabby, sandy, silver, brown, and all the combinations desirable from a blend of those colours. There are long-haired cats, there are short-haired cats, there is even a horrid hairless Mexican cat. Chinchillas, tortoiseshell, Persians, Russians, Manx, without a vestige of a tail, nor even a bone of one; Abyssinian, Indian, Siamese; white cats that are deaf, white cats that are tailless—what would you have? Every sort and size, every colour and disposition, is available, a triumph for scientific breeding.

Farewell, then to lion and family, and now to their near kindred. These are found in the civets, a tribe which, beginning with the cat-like fossa, has thrown up a great number of species, all in the Old World. Without dealing with anatomical niceties we may note that they are all long-bodied and short-legged.

THE PLUCKY LITTLE MONGOOSE THAT WILL FIGHT A SNAKE

The group includes the remarkable true civets, which develop a well known perfume. Africa, India, Malay, Java, Malabar, all give their name to civets; there are civets that rob the Java coffee trees of their ripe berries, civets that frequent the palm trees of Africa and Asia, and civets in the East which are otter-shaped and supremely adapted to life in the water—though sleeping, of course, on land.

In the same family we come next to the mongooses or ichneumons, as varied a group as the civets, distinguished into genera and species by colour, teeth, toes, thick tails, thin tails, short tails, white tails, red tails. Those which chiefly interest us, however, are the true mongooses.

These little animals, sacred in Egypt, are natural guardians of Indian and Egyptian homes. They are great snake fighters. Long ago there was an unspoken bargain between man and mongoose, that man should furnish the home and mongoose should fight and eat all the snakes that appeared in the family circle. The mongoose has redeemed his bond. He is believed to be unhurt by cobra poison, but he fights with such agility as rarely to be bitten; and with what satisfaction he converts a cobra into a meal! Master mongoose is not so pretty a pet as the jolly South African meerkat, but he is a fearless little ally when snakes come.

From the cats to the civets, from the civets to the hyenas, with that strange animal, the aard-wolf, to act as connecting link. Built like a long-legged fox, and resembling a starveling striped hyena in appearance, this creature, living in burrows, seldom seen by day, and eating carrion and termites, seems an isolated freak; but it shows us how civets developed along one line and hyenas along another, from a far-away common ancestry.

A HIDEOUS CREATURE THAT WAS ONCE COMMON IN ENGLAND

The hyenas themselves are creatures with a past. They were once common in England, and cracked bones that the sabre-toothed tiger had stripped of flesh. Now, restricted to three species, and to the warmer parts of the Old World, they continue to crack the bones left by more powerful animals, though they will attack a donkey or bullock if it be tied and helpless.

The striped, the brown, and the spotted hyena, make up the family today, the most repulsive of all mammals; powerful, ungainly, ferocious, but cowardly beasts. They will not face a waking man, but they will bite his face off if he be sleeping, or too ill to defend himself. In Syria and Palestine the striped hyena haunts rock-cut tombs; in India it is at home in rocky crevasses. Everywhere it despoils the couch of the dead.

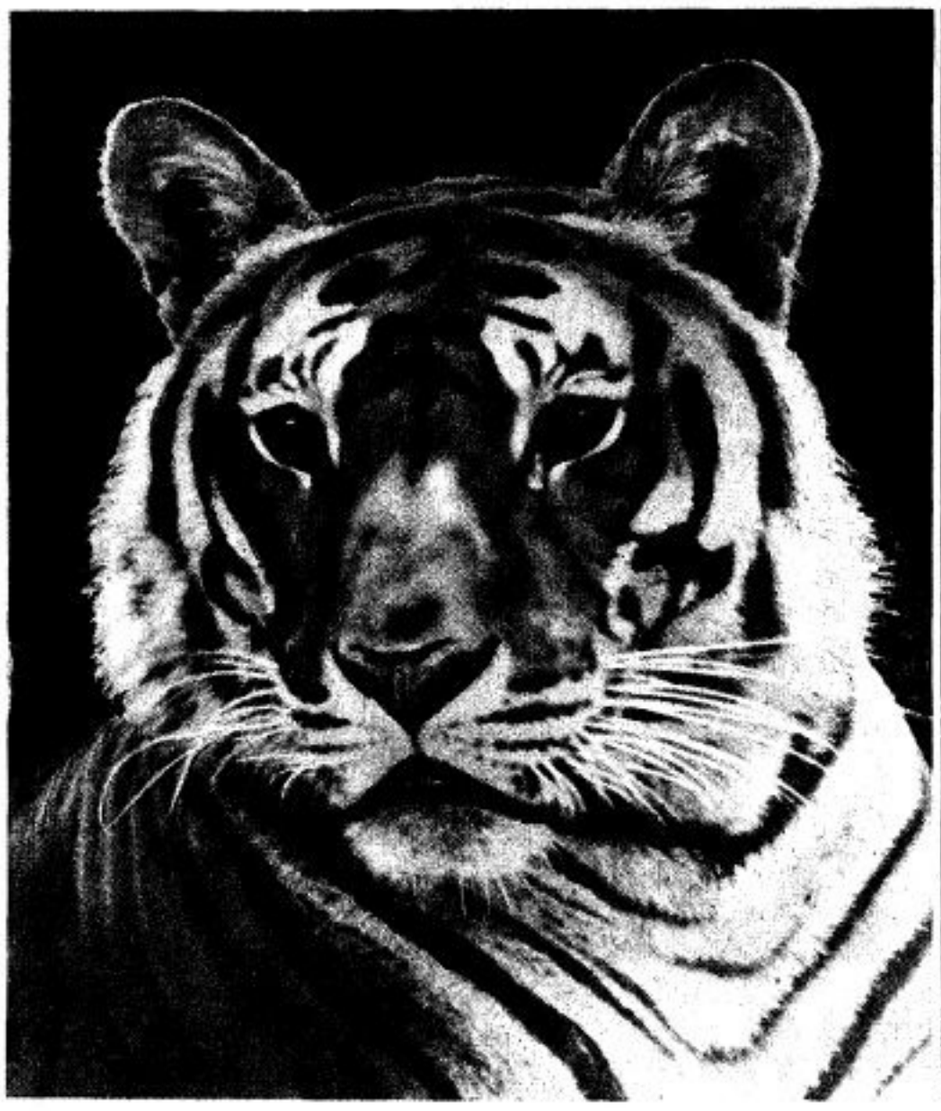
Its chief wonder is the might of its jaws. This feature is most pronounced in the ignoble king of the tribe, the spotted hyena of Africa. Here is a pair of jaws which can crack the thigh-bone of an ox as easily as we should crack a walnut. This is the fiercest of the three species, and will raid camps and kill small cattle and ponies. The brown species, which is the least common, is restricted to South Africa.

THE UGLY MEMBERS OF NATURE'S ORDER OF SCAVENGERS

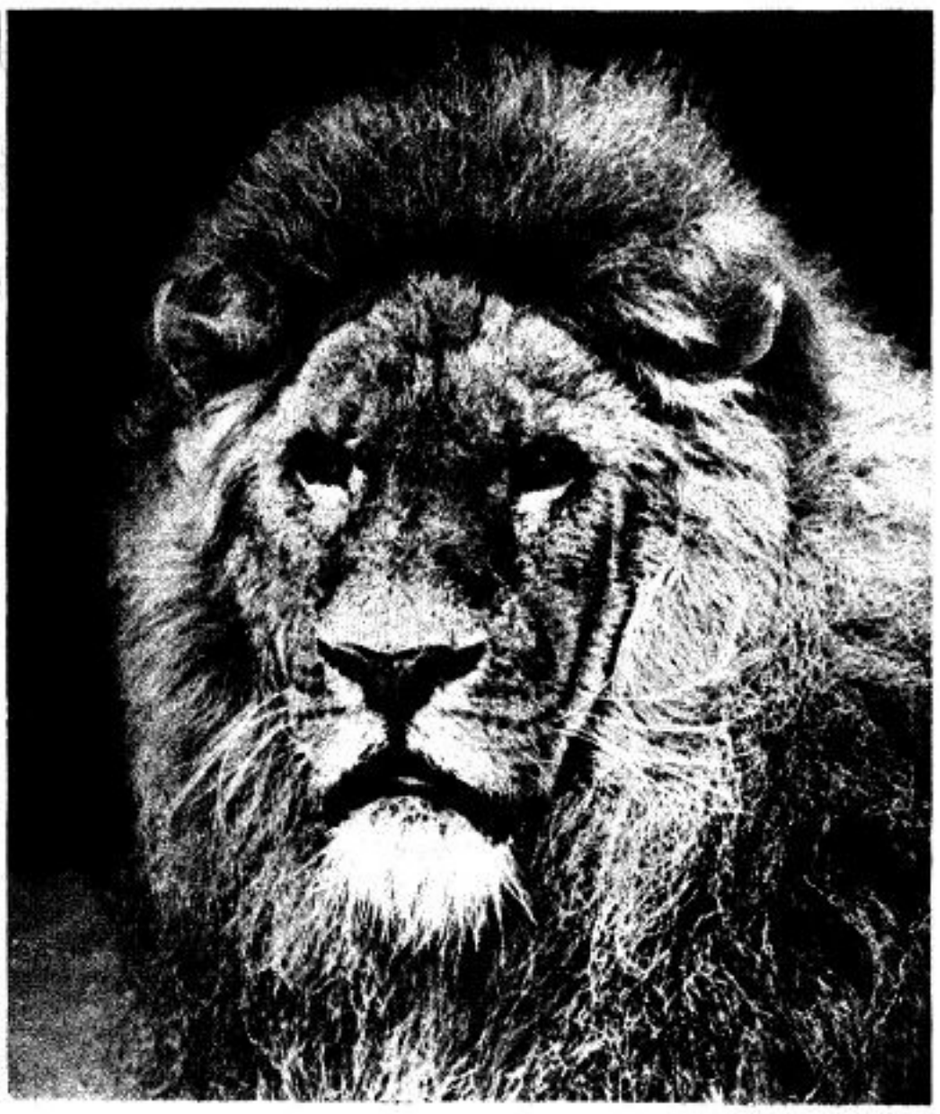
They are members of Nature's order of scavengers. They come after the gigantic feasts of the warrior animals. A lion has a kill and eats seventy pounds of flesh at a meal. The jackal and the vulture follow. But the hyena performs the last rite. He rids the scene of its pitiful evidences of tragedy. He is the living charnel-house, the receptacle of the bones. So even this noisome animal has its niche in the scheme of the living world.

MEMBERS OF THE GREAT CAT FAMILY

PUSSY ON THE HEARTH

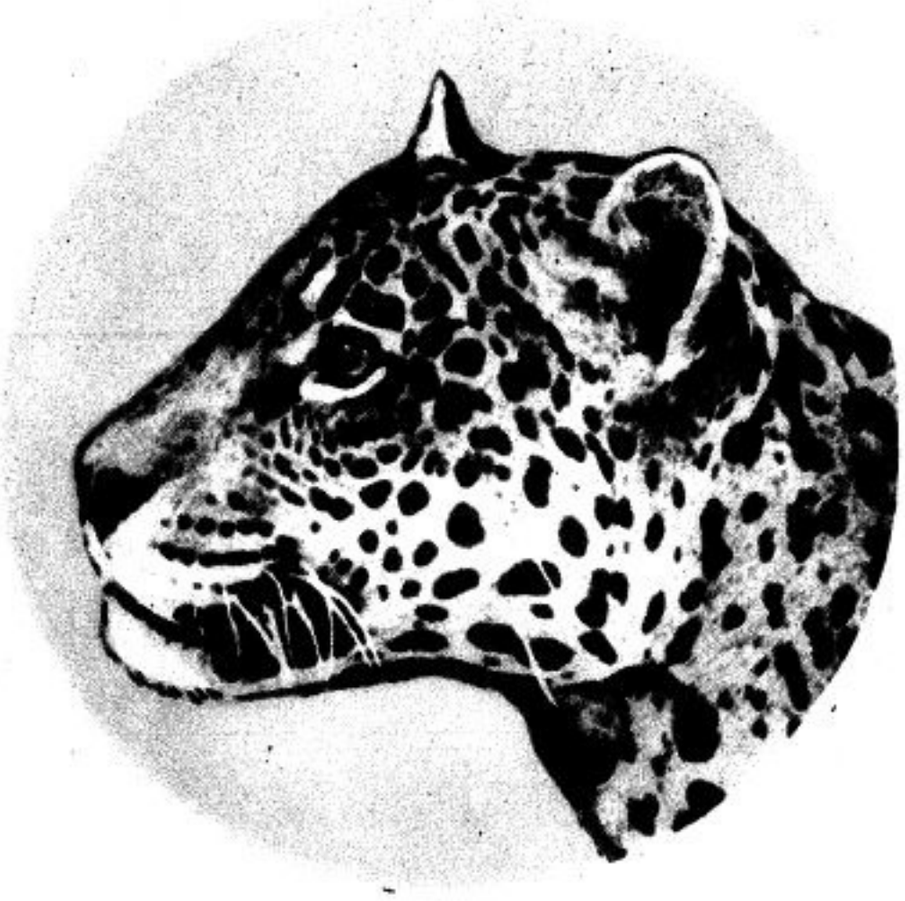


THE FIERCE TIGER OF INDIA



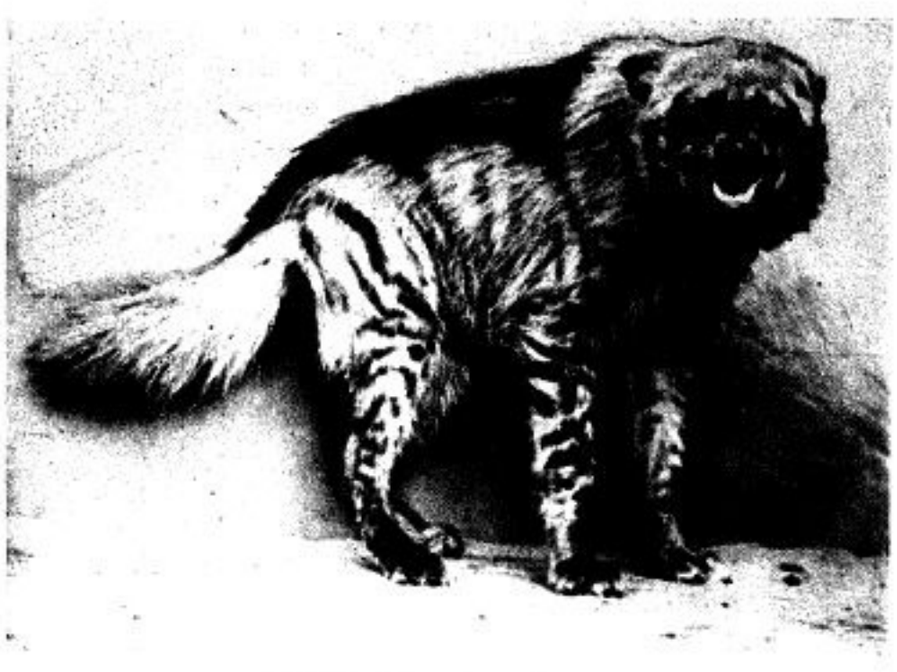
THE MAJESTIC LION OF AFRICA

THE FINE HEAD OF THE SNOW **LEOPARD**

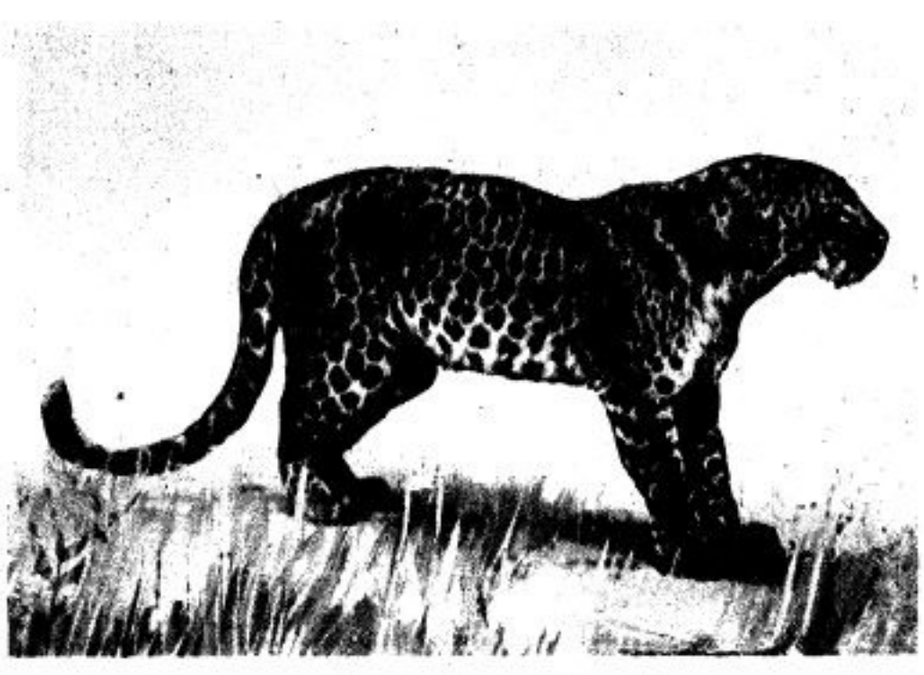


THE HANDSOME JAGUAR

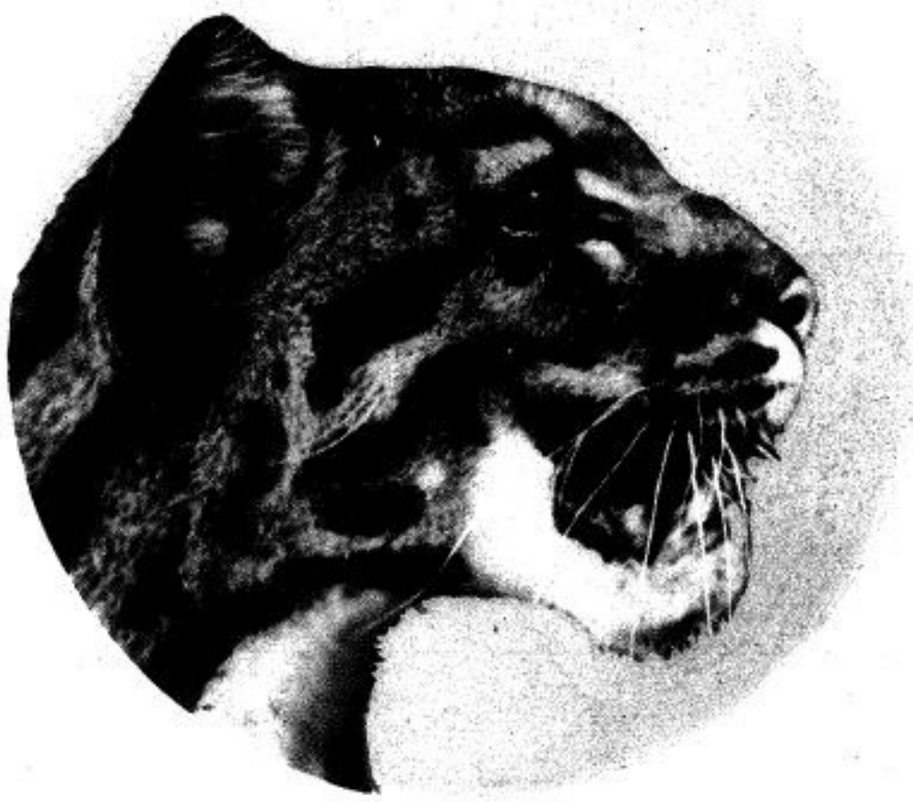
FIERCE-LOOKING WILD CATS OF SCOTLAND



THE STRIPED HYENA

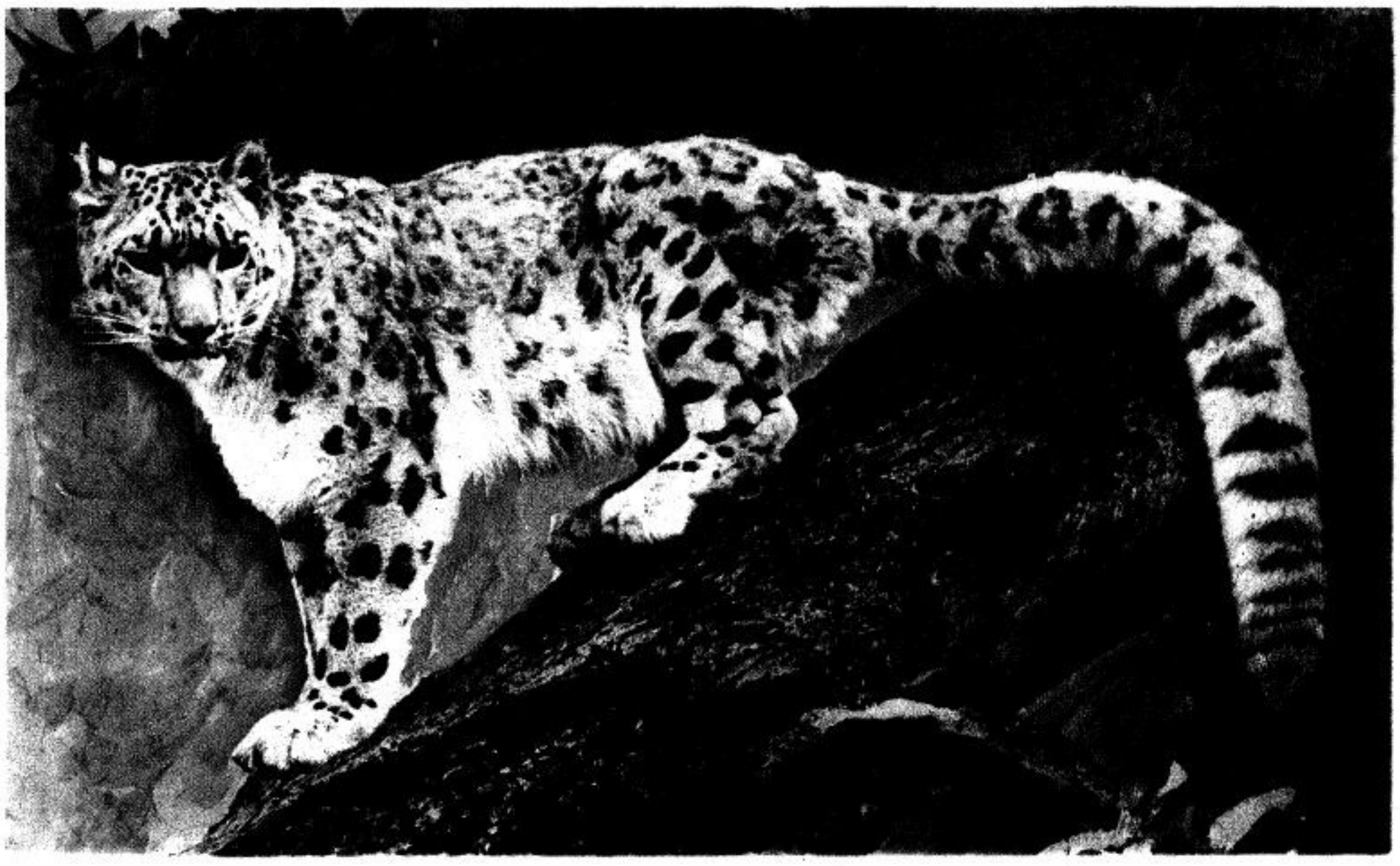


THE LEOPARD

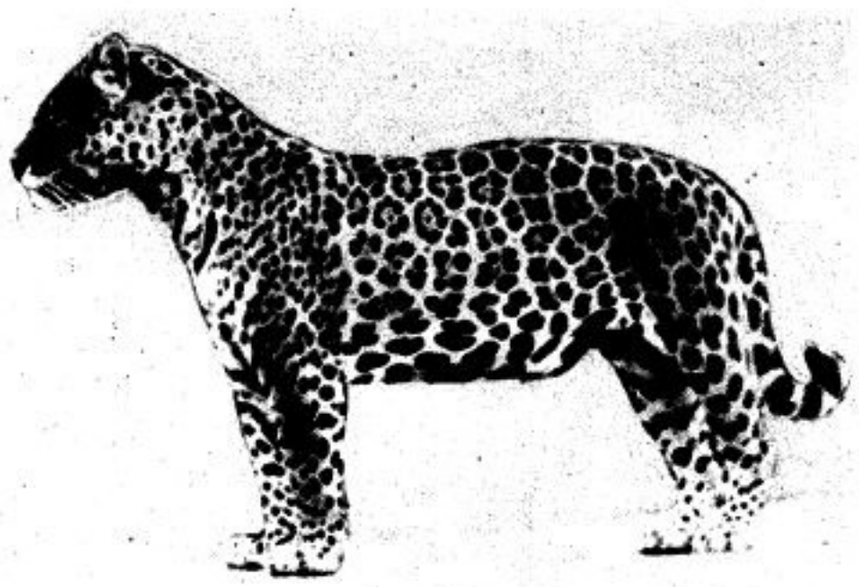


THE CLOUDED TIGER

A LIONESS LOOKS OUT

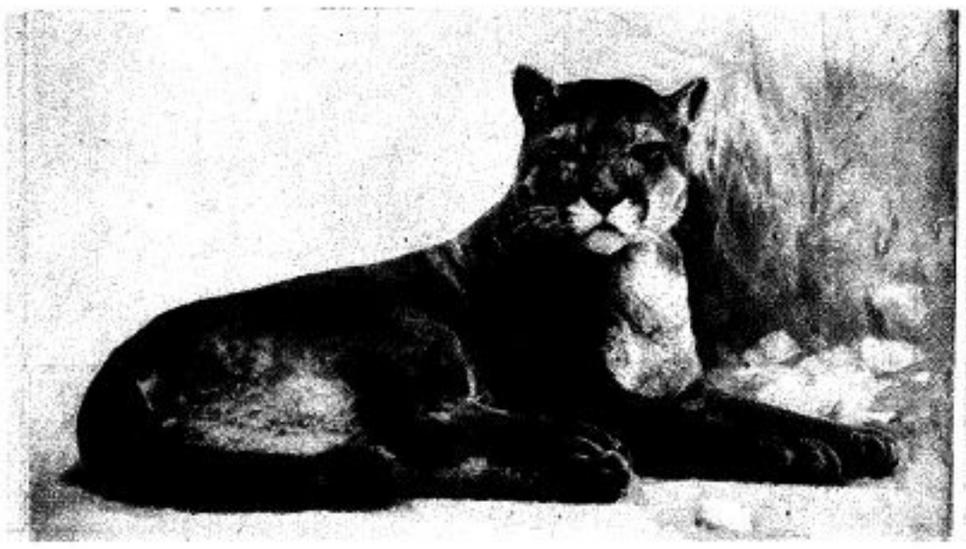


THE BEAUTIFUL SNOW LEOPARD

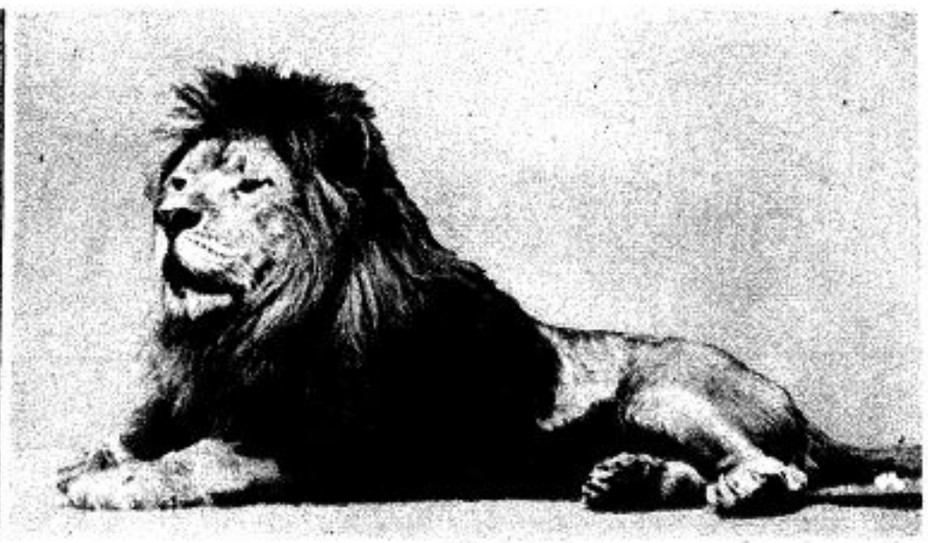


THE JAGUAR

THE LYNX



THE PUMA OF AMERICA



THE KING OF BEASTS

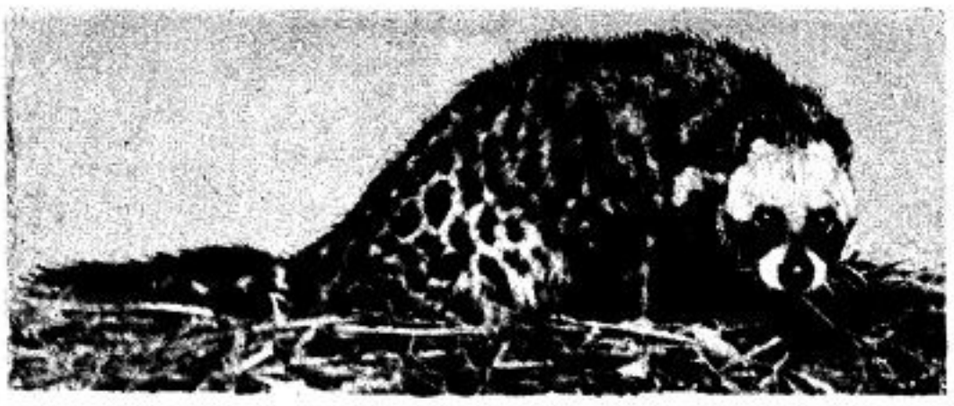
THE WEST AFRICAN SERVAL

THE TIGER AT HIS EASE

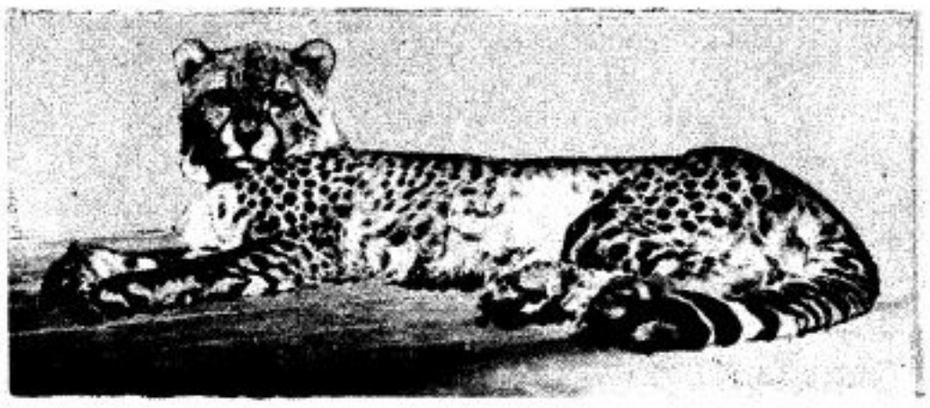
THE LEOPARD CAT

THE BINTURONG CIVET

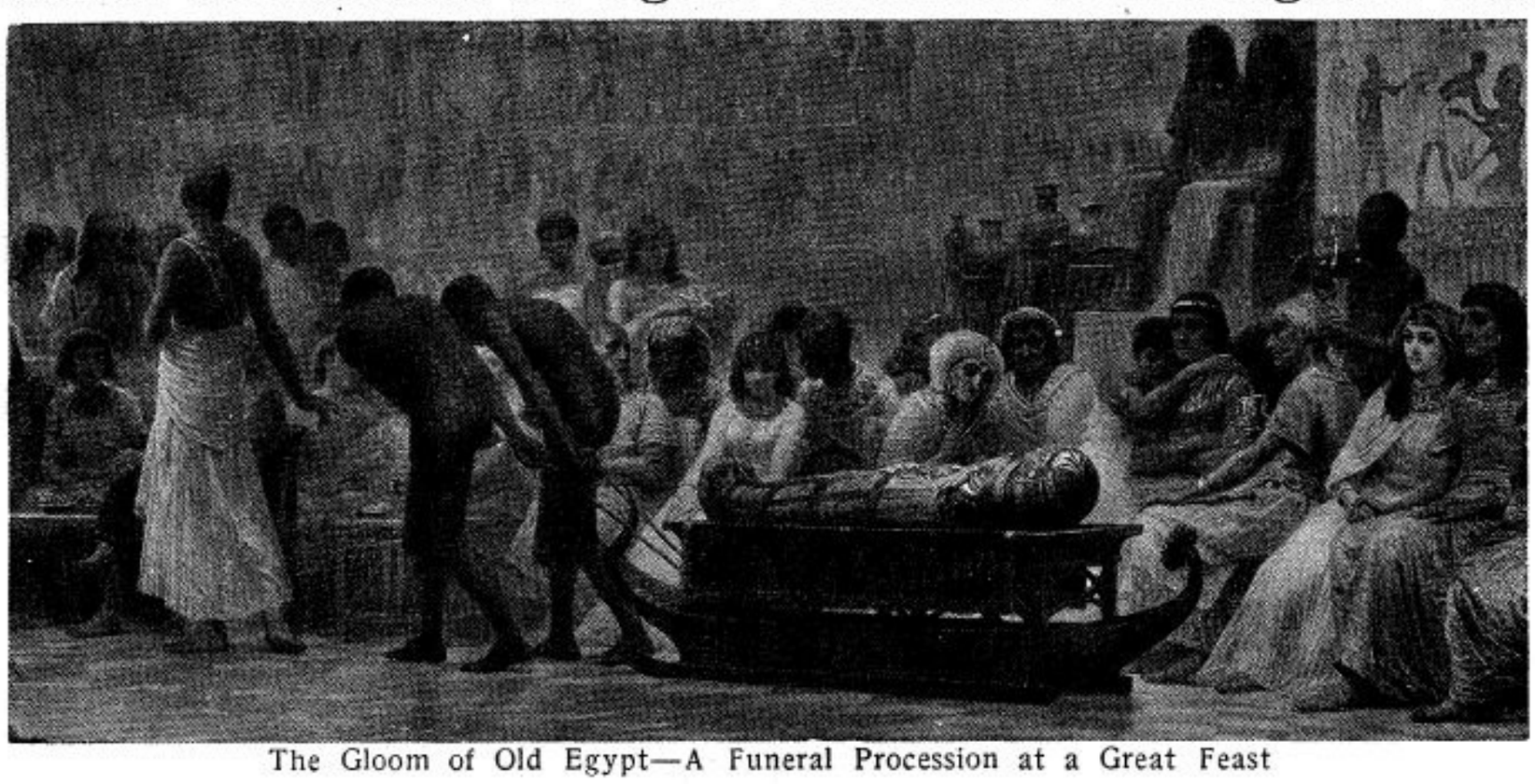
THE CARACAL



THE AFRICAN CIVET



THE CHEETAH



The Gloom of Old Egypt—A Funeral Procession at a Great Feast

THE WONDERING EGYPTIAN

WHILE the people who lived near the Tigris and Euphrates were fighting like wild animals, there was another set of people living in Egypt who were more peacefully disposed. In these people Mind pressed forward to the true adventure of life, making wonderful advances from barbarism.

These Egyptians were the first human beings to enjoy the blessing of peace. Their little country was guarded from enemies by sea and desert. For centuries no other race seems to have troubled them. They had probably escaped into Egypt to get away from war. And so, because they had peace, the mind of man, working in those Egyptian bodies, was able to give its attention to the mystery of existence, and that means progress.

Every year between July and September the river flowing through Egypt lifted itself up, washed over the banks, and spread far afield in a shining flood. When those waters had disappeared the barren earth was covered with a soft ooze of mud, and under the rays of the sun there soon appeared through this rich river mud a mantle of green herbage.

The mind of the peaceful and observant Egyptian told him that if he sowed grains of corn in that river mud, and drove his sheep over it so that the seed was trodden into the soil, he would reap a wonderful harvest. Not only, then, was he free from enemies, but free from many of the more arduous labours of agriculture. The Nile did for him what other people had to do for themselves.

Thus we find in these Egyptians those first stirrings towards a wider and more gentle life, which we call civilisation. They cultivated fruits and made ropes of papyrus; they built irrigation works and raised gigantic buildings greater than any seen on Earth before them; they became artists and authors.

Finally, they established religion. How did the Nile rise every year and overflow its banks? Who was it performed this annual miracle? A man could not do it. A man might lift a bucket of water, but what man could lift a great river and spread it over miles of land? Clearly it was the work of a very big man, the biggest of big men, a god.

They looked up and saw the stars. Nothing is more memorable in the history of our race than the early lifting up of man's eyes to the shining firmament. No animal, we may be sure, bothers its head about the planets. No bird, we may be certain, has studied an eclipse. No

creature save man has ever felt that the heavens are sublime in beauty and majestic in power. Quite early in the history of civilisation, which means the history of the human mind, we find men studying the stars, watching their movements, associating them with events on the Earth. It is as if men felt instinctively a kinship with the universe. Their curiosity was aroused. The Nile overflowed his banks. The stars moved through the heavens. How? Why? Curiosity is one of the greatest powers in science and civilisation.

THE EGYPTIAN BEGINS TO THINK THAT MIND MUST BE BEHIND MATTER

The mind decided that behind the vast forces of Nature there were powers like its own, but much greater It said there was a good power, and named it Osiris; and an evil power, and named it Set. Osiris had a wife named Isis and a son named Horus. It was possible to secure the favour of Osiris by offering little gifts to Isis.

We observe much error in all the first guesses of the mind at the mystery of Nature, but there is always a grain of truth. Before astronomy there was astrology; before chemistry there was alchemy. Bad shots, perhaps, but shots in the right direction. So it was in religion. What we call heathenism contains at least an element of truth. Superstition is a bad shot, but it is a shot in the direction travelled by the noblest of religions and the very greatest of the sons of men. Like the child learning to walk, the mind staggers in its first steps toward truth. It, too, must learn to walk before it can begin to run.

Thus did the mind in man very early connect itself with the Mind which is behind the universe. Very early, too, it began to feel itself responsible to this great Mind. That great Mind wished it to act in a particular way, not in another way; moreover, after death the human mind would live again, and the great Mind would call it to account for all the deeds done in the body.

THE EGYPTIAN PRIEST AS MORALIST, SCIENTIST, AND OWNER OF LAND

In this wonderful conviction the people of Egypt took a tremendous stride toward civilisation. For if man felt himself to be an animal, and was certain that he would not live again after death, he would submit to no laws which stood in the way of his own animal pleasures. But religion gave him an inward law, a law of right and wrong, and set that law in his conscience, and left him alone with the tremendous thought of God.

The greatest person in Egypt was the priest. To him were unveiled the mystery of the stars and the knowledge of life and death. No one else was a student. The rest were drilled in the army to protect their land from invasion, or were farmers, or were artisans. The priest contemplated the stars, studied Nature, cross-examined travellers, and wrote books on papyrus leaves. It was from him that the rest of the nation learned how to answer the questions which arose in their minds. He was the brain-worker.

Enormous power was given to these Egyptian priests, and they used it well. They owned most of the land. They made all the laws. They helped to subdue the animal side of man's nature. Magnificent temples arose in Egypt, so that the thought of the gods was ever before man's mind; and magnificent tombs were raised for the dead, so that the thought of immortal life was impressed on the people's mind. But, unfortunately, religion became to the Egyptian another word for fear, and he lived with very little joy, thinking only of pacifying the gods, the terrible thought of death haunting him.

THE DEBT THAT CIVILISATION OWES TO EGYPT AND ITS PRIESTS

In spite of this sad feature of Egyptian civilisation, we look back to it as the first creative movement of the human mind in those fields of energy and achievement which have given us such extraordinary power over Nature.

You may still see in Egypt the relics of this amazing civilization. Columns of a sublime grandeur still lift themselves clear of the dust of many centuries, and the tremendous Pyramids still witness to these present times of the astonishing mechanical power of these people. No shaped or fitted stones have so strange a tale to tell as these creations of the Egyptian mason. Far back in the past there was an uprush of the human spirit to express itself with great glory and a magnificence that would never die. At a time when our ancestors were the lowest of savages, and these British Isles were a jungle, men in Egypt flashed back the sunlight from temples which were like the courts of

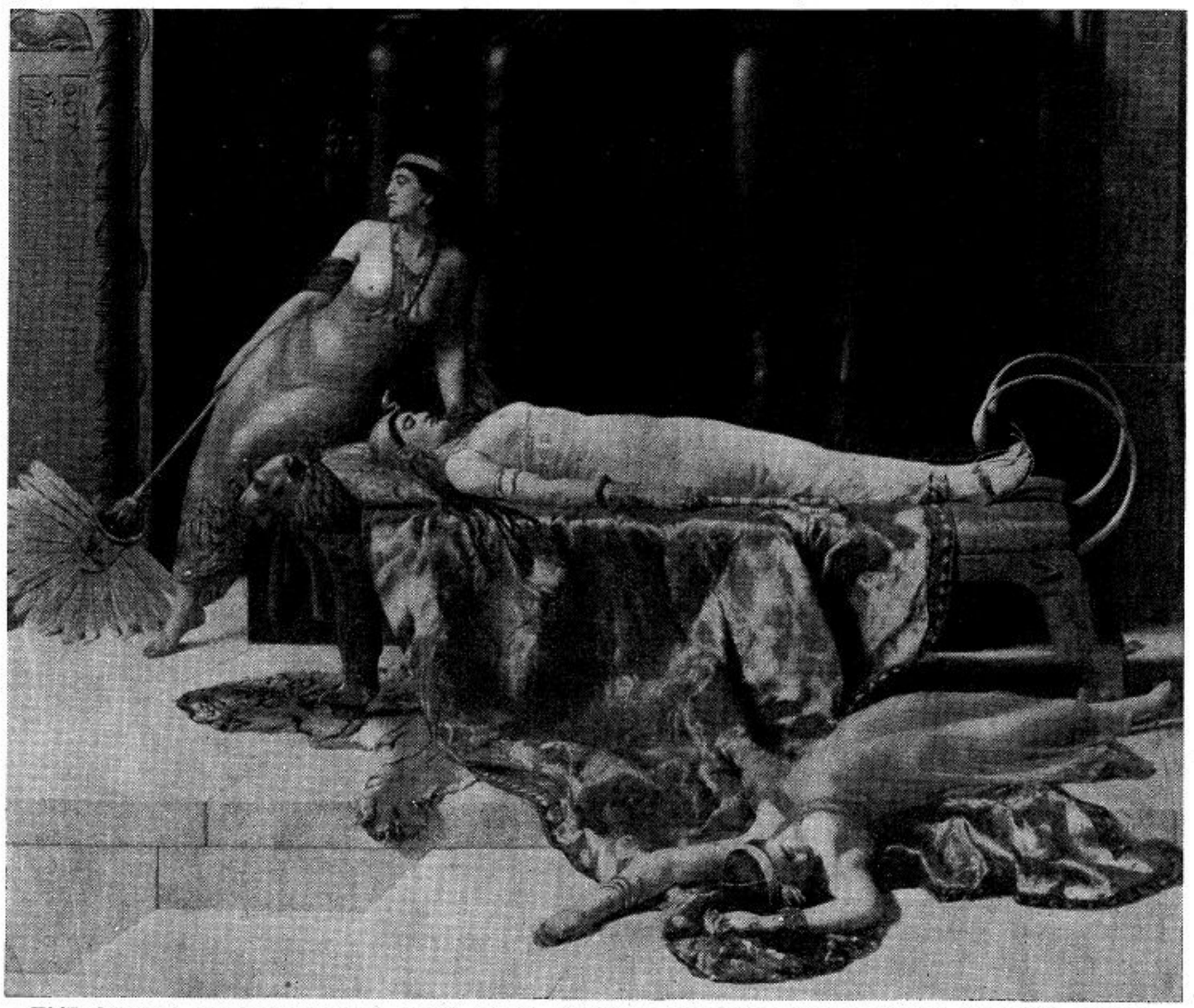
heaven and caught the moonlight on stones set up in the desert as monuments of man's faith in immortality. Glorious was this achievement of those ancient Egyptians, and it expressed their answer to a movement in the human soul which carried humanity away from the savage and some distance at least toward the divine. Four thousand years before the birth of Jesus, twice as long a space of time as has elapsed since that supreme event, the Egyptian bowed himself in the dust of the desert before his Great Pyramid and shuddered at the thought of God.

In later years a far greater people was to carry this movement of the mind away from fear and superstition, but the Egyptians were the first of all the races of mankind to conceive grandly of human life and to advance along the road of observation and discovery. Our debt to the Egyptians is quite incalculable.

These people cultivated barley as well as wheat, and grew crops of radishes, lentils, and peas. They made use of wool as clothing. They understood arithmetic and could scarcely have built their amazing Pyramids without a knowledge of mathematics. Their cities were large and noble. Their temples had no equal in the world. They trained dogs for hunting, domesticated the cat to catch birds, and rode on the backs of horses.

If the priests had not written their records on perishable papyrus leaves they would have bequeathed to us a library of immeasurable value. In spite of their superstition, they were keen seekers after truth, and this spirit showed itself in their arts and crafts, as well as in their science and religion.

The fame of their country became known all over the world, and many nations travelled there with goods to seek an exchange for the Egyptian's merchandise. His caravans travelled far across the deserts. His ships were to be seen on every sea. It was some 4000 years before the birth of Jesus that the Great Pyramid was built and the Nile was canalised. Ancient indeed are the glories of Egypt. Think of their temples



THE DEATH OF CLEOPATRA, THE LAST QUEEN OF EGYPT BEFORE THE ROMANS CAME

This picture by the Hon. John Collier is in the Oldham Art Gallery: the picture on page 425 belongs to the Fine Art Society

and their astounding tombs, of which we have read in our group on Art.

The influence of their civilisation extended far, and must have been felt even in the most advanced cities of war-harassed Mesopotamia. We know that the people of Babylonia were very much in earnest about education, and that women there knew how to read and write as well as men. Two thousand years before the birth of Jesus, Hammurabi, a king of Babylon, issued a Code of Laws which show us clearly how far the mind of man had advanced from barbarism as many years before the birth of Jesus as the world has seen since. Here are a few of those enactments, translated by Mr. C. H. W. Johns:

If a builder has built a house for a man, and has not jointed his work and the wall has fallen, that builder at his own cost shall make good that wall.

If a man has stolen a watering machine from the meadow, he shall give five shekels of silver to the owner of the watering machine.

If a doctor has treated a gentleman for a severe wound with a bronze lancet and has cured the man, or has opened an abscess of the eye for a gentleman with the bronze lancet and has cured the eye of the gentleman, he shall take ten shekels of silver.

THE WEAKNESS OF A CIVILISATION FOUNDED ON SLAVERY AND WAR

There are punishments for men who neglect to keep the bank of a canal strengthened, showing the communal nature of society, and one or two terrible punishments showing that the mind had not yet reached the idea of mercy:

If a woman has not been economical, a goer about, has wasted her house, that woman one shall throw into the waters.

If a man has caused the loss of a gentleman's eye, his eye one shall cause to be lost.

If a man has made the tooth of a man that is his equal to fall out, one shall make his tooth fall out.

All these ancient civilisations, we must remember, were built up on the labour of slaves. From war man had learned this bad idea. It came to him as perfectly natural, for what could be wiser than to enslave those who might try one day to take his land from him? War will justify every wickedness. It is the great denial of man's spiritual nature. If there had never been any war in the world we should now be thousands of years in advance of our present ideas; and yet, as we have seen, war did teach men certain virtues and did hasten them toward the first foothills of civilisation.

But slavery is one of the most dreadful records in the history of mankind, and a record which always ends in retribution. Among the slaves in Egypt were the Hebrews, destined to make a marvellous contribution to human history, yet so marked by slavery even to this day that they creep in among other nations, and do not always, as they mostly do in England, associate themselves with the fortunes of their adopted countries.

THE FATE THAT MUST ALWAYS FOLLOW CRUELTY AND FEAR

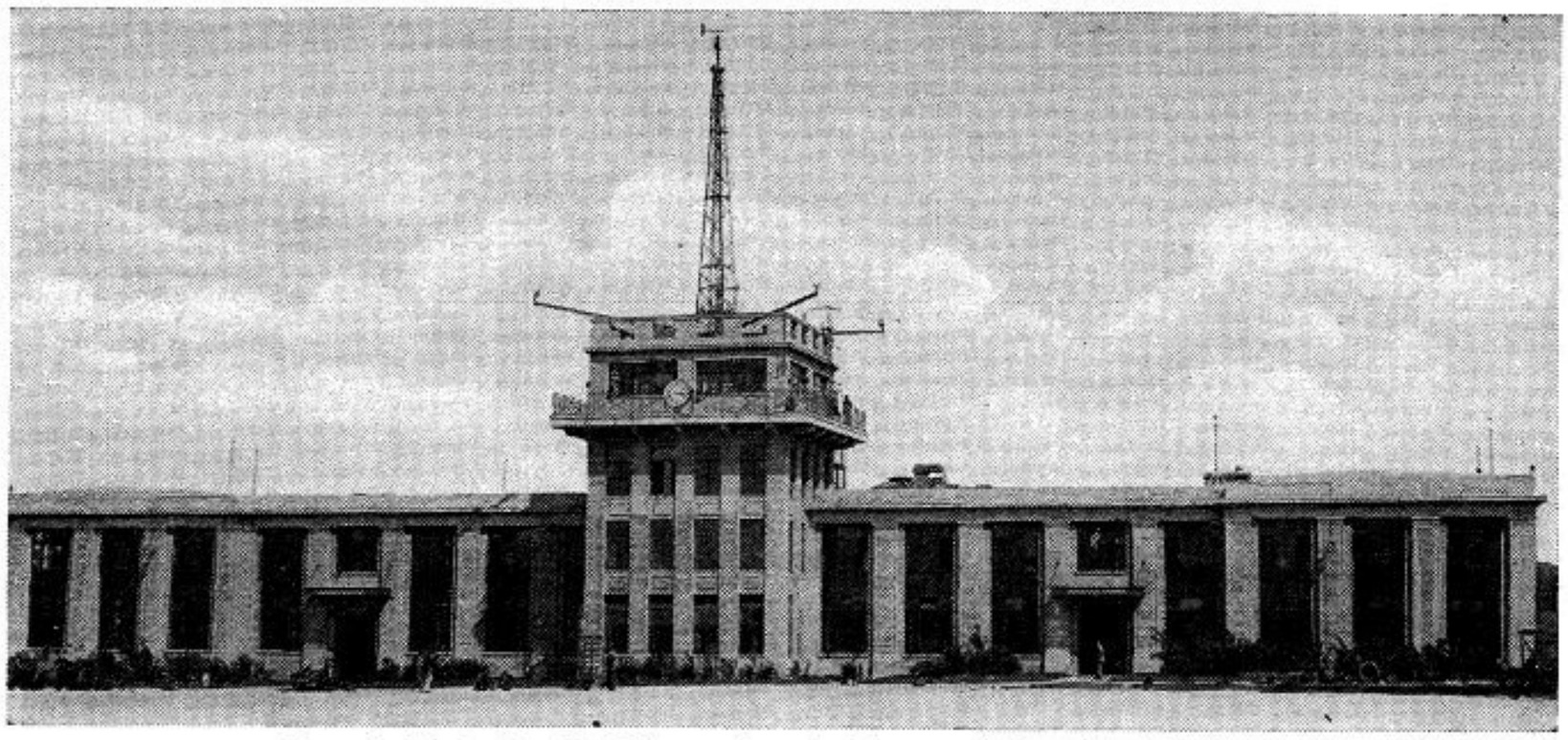
Egypt was destined to fall because she depended on slavery. Her own people had become soft and effeminate. Everything hard and healthful was done for them by slaves. The greater their prosperity the greater the temptation they offered to other nations. There they lay, in a rich land covered with fertile fields and studded over with noble cities, a people who almost called to the invader.

Thus far had the human mind travelled from barbarism when Egypt fell into alien hands, never again to be independent. Man had learned something about Nature, had risen to great heights in architecture, had learned to sail ships across the sea, had become a craftsman, an artist, an astronomer, a writer, a physician, and a priest; but he was still cruel with the cruelty of an animal; he had learned to extend his natural fear of wild beasts, not only to his fellow-men, but to the invisible Powers of the universe.

THE SLOW ESCAPE FROM A CREED OF FEAR TO A CREED OF LOVE

We leave him for the present in the grasp of this terrible fear which we call superstition, observing that one body of the human race, escaped from Egypt, had conceived the idea of a God greater than all other gods in the world, and had made the worship of this righteous God the supreme concern of existence. But even among the Hebrews seeking their freedom in Palestine superstition was an immense power, in spite of the inspiration of their poets, who sang with joy and exultation of the mercy and loving-kindness of this God of gods. Not easily was the human mind to recover from the stunning effect of its first realisation that, invisible to the human eye, there existed a Power in the universe with which it had to do, both in life and in death.

The Story of the Things We See About us Every Day



The administration building and control tower at Croydon Aerodrome

THE GREAT AIRPORT

IT is not so very long, as history goes, since the Railway came, and for thousands of years before then men had nothing but the Horse. It is only a generation since the Motor came, and for fifty years before that man had nothing but the Train. It is not so long since men were laughing at the idea that we should fly. The Editor of this book remembers seeing Wilbur Wright's first flights in Europe, when he would rise in a field in France with men pulling hard at a rope to give him a start. Today we can fly round the world.

It is not long since a girl surprised the world by flying to Australia, and even young people remember a man flying the Atlantic with nothing but a few sandwiches in his pocket, so sure was he. Now Croydon has become as busy as Charing Cross ; we may call it the Charing Cross of the Flying World, for we can walk in at its gates, take a ticket for almost any country, and fly there. It is the English centre of the greatest transport transformation ever known.

Let us join the passengers on one of the big air liners. We buy our tickets at any travel agency or at Airway Terminus in London if we are travelling by Imperial Airways. Here we are weighed, and so is our luggage. Various formalities are attended to and, our luggage having already been loaded, we join a waiting motor-coach which takes us to Croydon.

We soon arrive here and drive in as to the yard of a railway terminus, and after alighting we enter the large booking-hall. All round the hall are the offices of the flying companies whose planes operate from Croydon—Belgian, British, Dutch, French, and German—and other concerns. There is, too, a bookstall, and there are numerous seats, for this is a waiting-room as well. Presently a porter arrives. "Passengers for Paris this way, please," he calls, and we follow him through another hall where our passports are examined.

Meanwhile the coach which brought us from London has driven round to the plane and our luggage has been placed on board. Mails also have been stowed away. Before the plane has been towed round to the place of departure by a tiny tractor it has been inspected to make sure that all controls and engines are in perfect working order, tanks have been filled with oil and petrol, and the flying stewards have replenished the kitchen. The planes

of the Scylla and Heracles classes have four 555 horse-power engines which consume 160 gallons of petrol an hour.

When all passengers and the captain and his crew are aboard, the engines are opened out and the machine taxis across the aerodrome to a position where it can turn into the wind and have a fair runway in front of it. No plane may take off without permission from the control tower, a lofty structure above the administration buildings which may be called the nerve centre of the aerodrome. A man on the control tower gallery focusses a signalling lamp on the plane's pilot and when the pilot sees the lamp flash he knows that he may take off. A short run across the ground, and the monster weighing about 14 tons is soon in mid-air and on its way.

Although the departing planes may only take off with permission, the pilots of incoming liners may use their discretion about landing in daylight. The pilots circle above the aerodrome in an anticlockwise direction until all is clear.

AS FASCINATING IN SOME WAYS AS A VISIT TO LONDON'S DOCKS

Porters with luggage trucks are waiting as a plane reaches the ground, and the luggage is taken into the Customs examination hall, where passengers open their cases for inspection. Passports are then examined while luggage is being loaded on to the coach for London and passengers are soon clear of the airport.

Hundreds of passengers pass through Croydon daily, but the carrying of goods of all descriptions is an important part of the work of the airways, and many planes carry goods only.

A peep at the freight departments at Croydon can be as fascinating in some ways as a visit to London's docks. At the airport we may see consignments of gold which left the region of the mines in South Africa only a few days earlier, or we may see fruit and vegetables which were gathered in France the same day.

Most of the passenger work is done during the hours of daylight, but there are planes, both passenger and goods, which arrive or depart at night. Planes approaching Croydon have sometimes been able to see the airport's neon beacon when 80 miles away. Its distinctive red colour and flashing character enable pilots to recognise it immediately as the Croydon beacon, and in normal conditions it can be seen at a range of 45 miles.

Arrived over the aerodrome the pilot looks for the illuminated wind indicator. This is a large T, outlined with neon tubes and mounted to swing in the wind, so that the pilot knows he must land in the direction of the upright line toward the cross piece. White flares are also set out on the aerodrome.

ELABORATE PLANS TO ENABLE THE PLANE TO MAKE A SAFE LANDING

Flashing red lamps placed along the boundary of the safe landing area indicate its shape and extent, and high structures in the vicinity of the aerodrome have at their peaks warning red lamps. A portable floodlight of a million candle-power illuminates the ground effectively for a distance of 600 yards. The apparatus, including its own generating plant, can be driven quickly to any part of the aerodrome.

When a plane is about to land the light is directed horizontally up-wind, and the pilot, having been granted permission to land by the flashing of a green light from the control tower, comes down over the floodlight, keeping parallel to the centre of the beam. The apparatus can also give an effective diffused light through an angle of 180 degrees.

Wireless plays an important part in the operation of an airport and messages are frequently passing between the port and the planes in flight. Thus a pilot can be warned of changes in weather conditions on sections of his route ahead.

EFFICIENCY AND ABSENCE OF FUSS AT LONDON'S GREAT AIR PORT

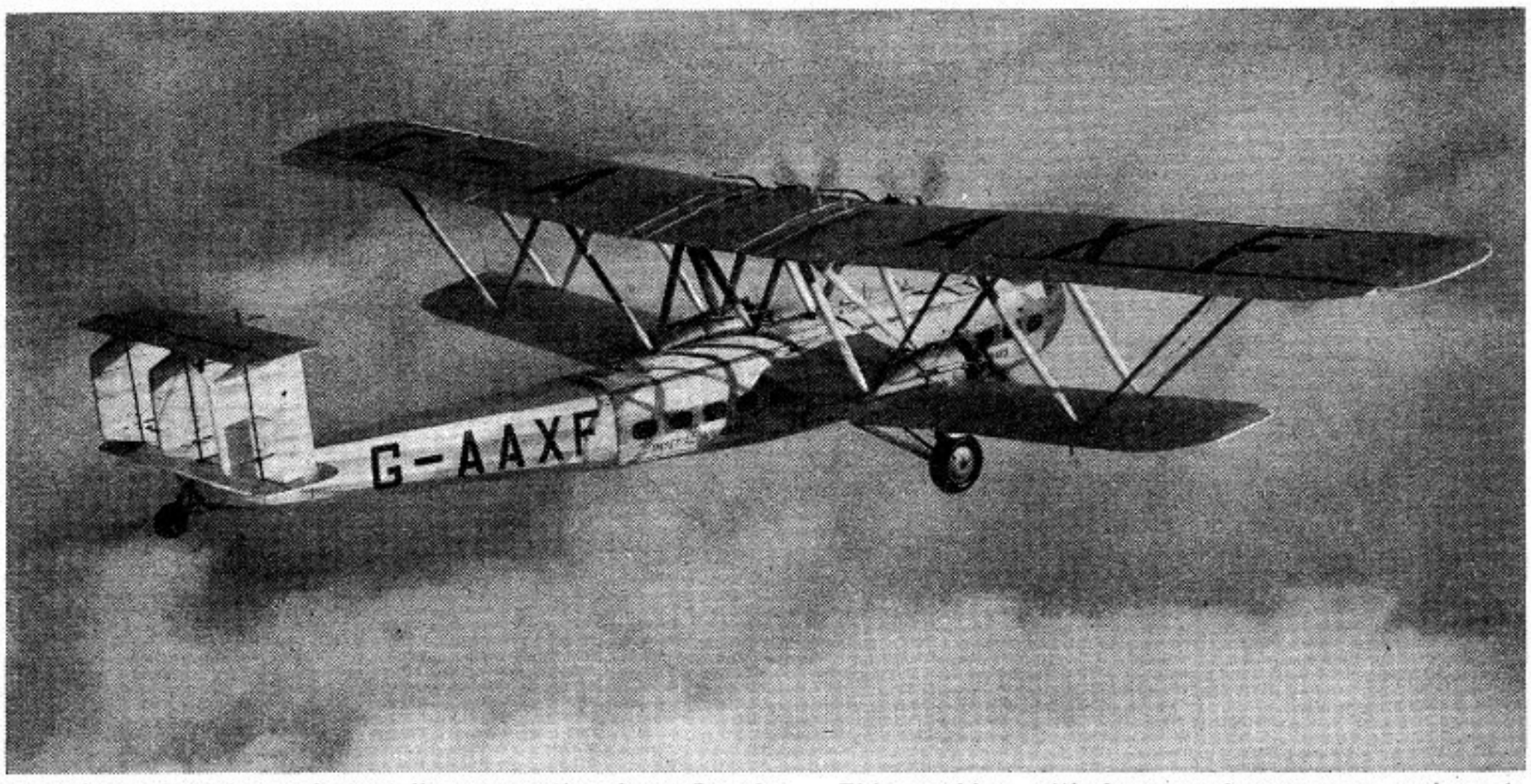
If the pilot is flying through mist or fog he can be given his bearings and so guided to his destination by means of the wireless direction-finding apparatus, worked in conjunction with the aerodromes at Pulham in Norfolk and Lympne in Kent. The aerodrome for which a plane is bound is also given by wireless full details of the plane and its load, with time of departure, so that plans can be made for its reception.

The Airport of London at Croydon is a very busy place, with planes coming and going with great regularity day in and day out; and although we are only at the beginning of the Flying Age it is carried on with the same efficiency and absence of fuss that distinguish the operation of any great railway terminus.

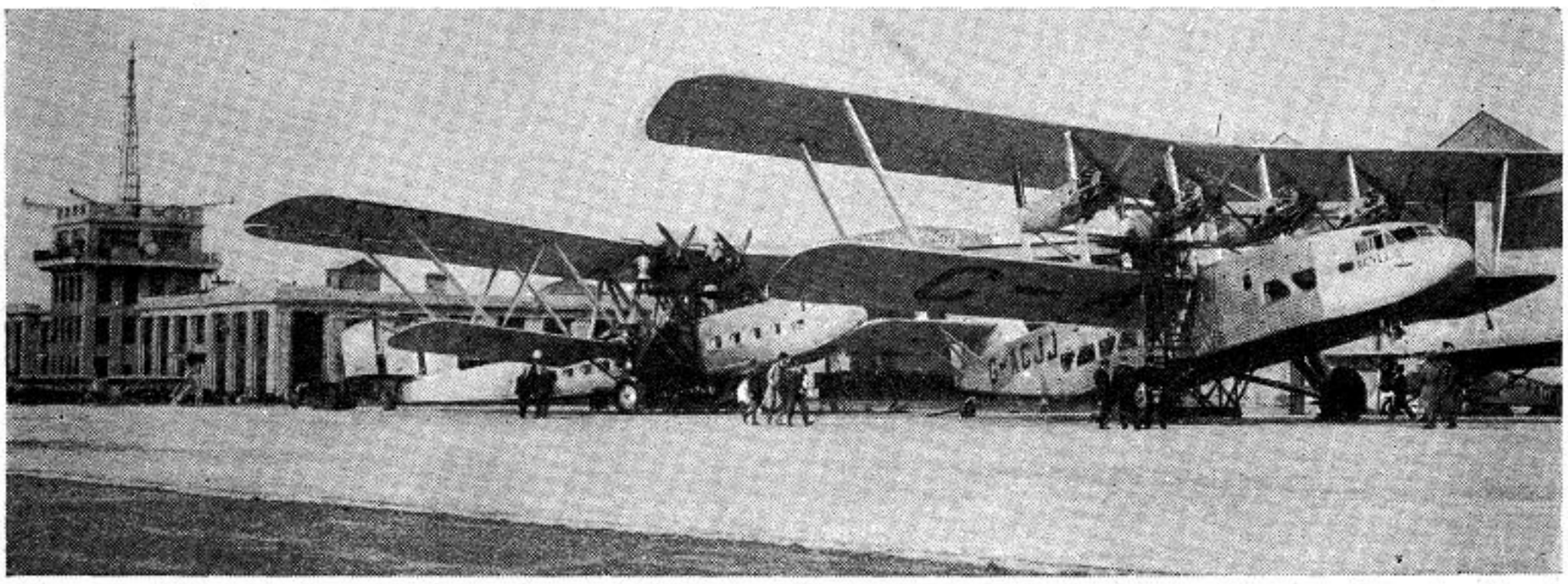
PICTURE-STORY OF THE AIRPORT

The airport of London at Croydon is the open door to almost anywhere in the world. Here is a liner drawn up close to the administration buildings with passengers embarking for the first stage of their journey to the Far East.

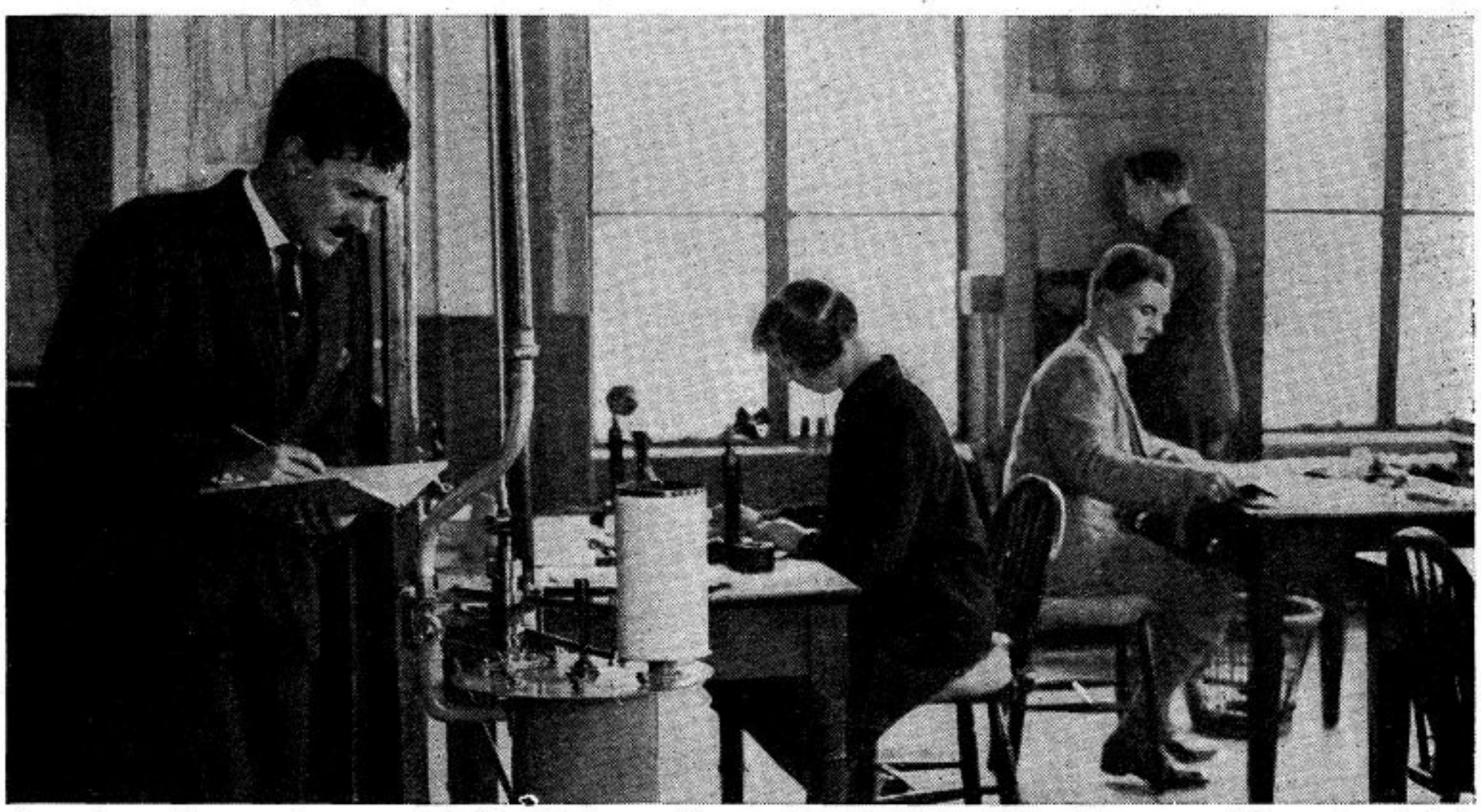
GROUND-WORK TO KEEP THE PLANES IN FLIGHT



Here is another type of giant liner operating from Croydon. This machine, with four 555 horse-power engines, is designed to carry a crew of four or five and 38 passengers. Meals are served in this as well as the Scylla class of liner.

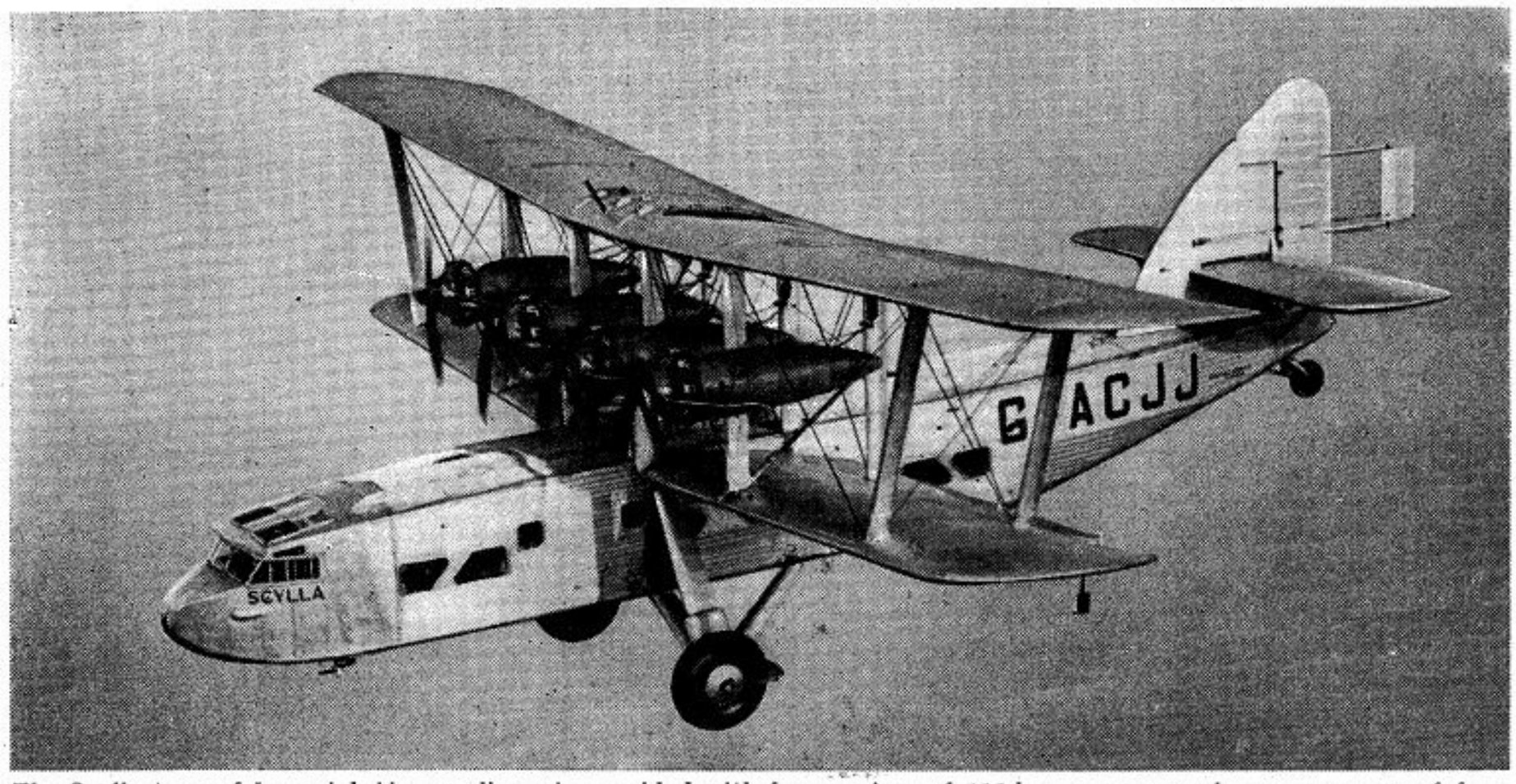


After every flight machines are thoroughly inspected by engineers to ensure that no defects which may have developed during the flight remain undetected. The tiny figures of the men among the engines emphasise the size of the machines.

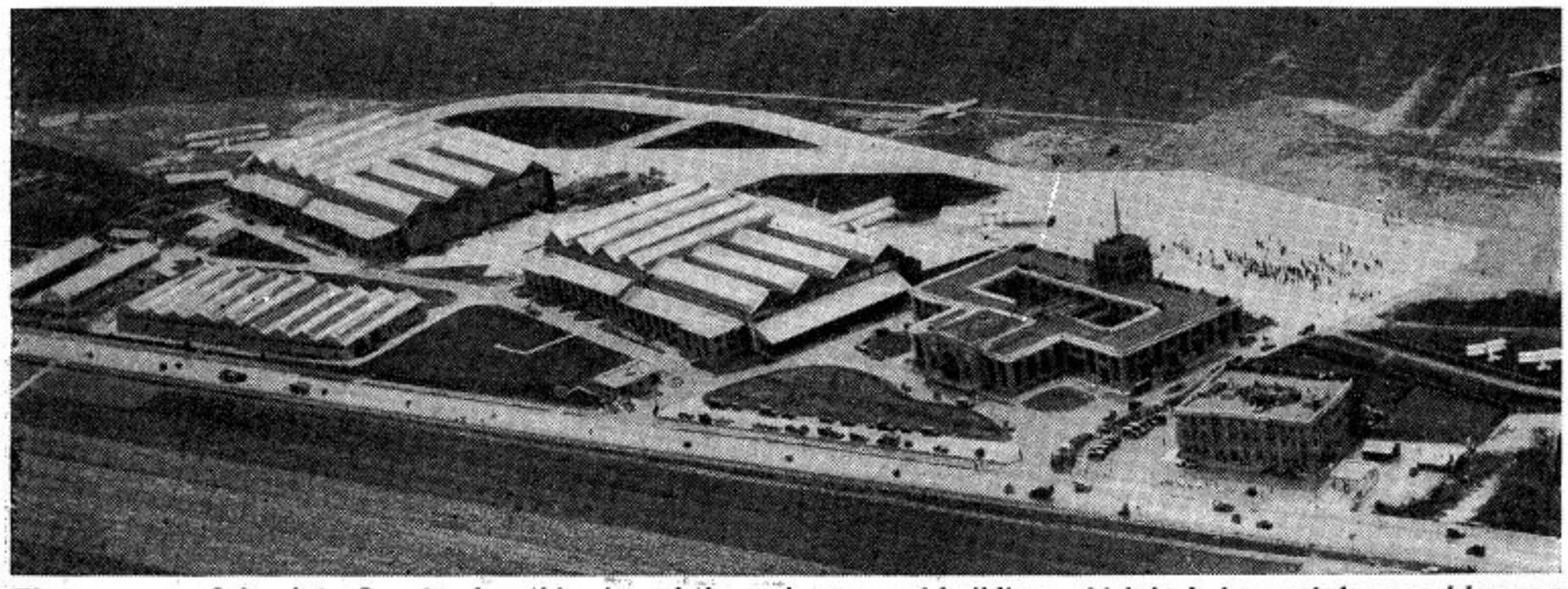


Accurate weather reports are essential for the successful operation of airlines. Here is a corner of the meteorological office in the control tower at Croydon. In the foreground notes of wind conditions are being taken from an instrument.

HOW THE FLYING TRAVELLER SEES CROYDON



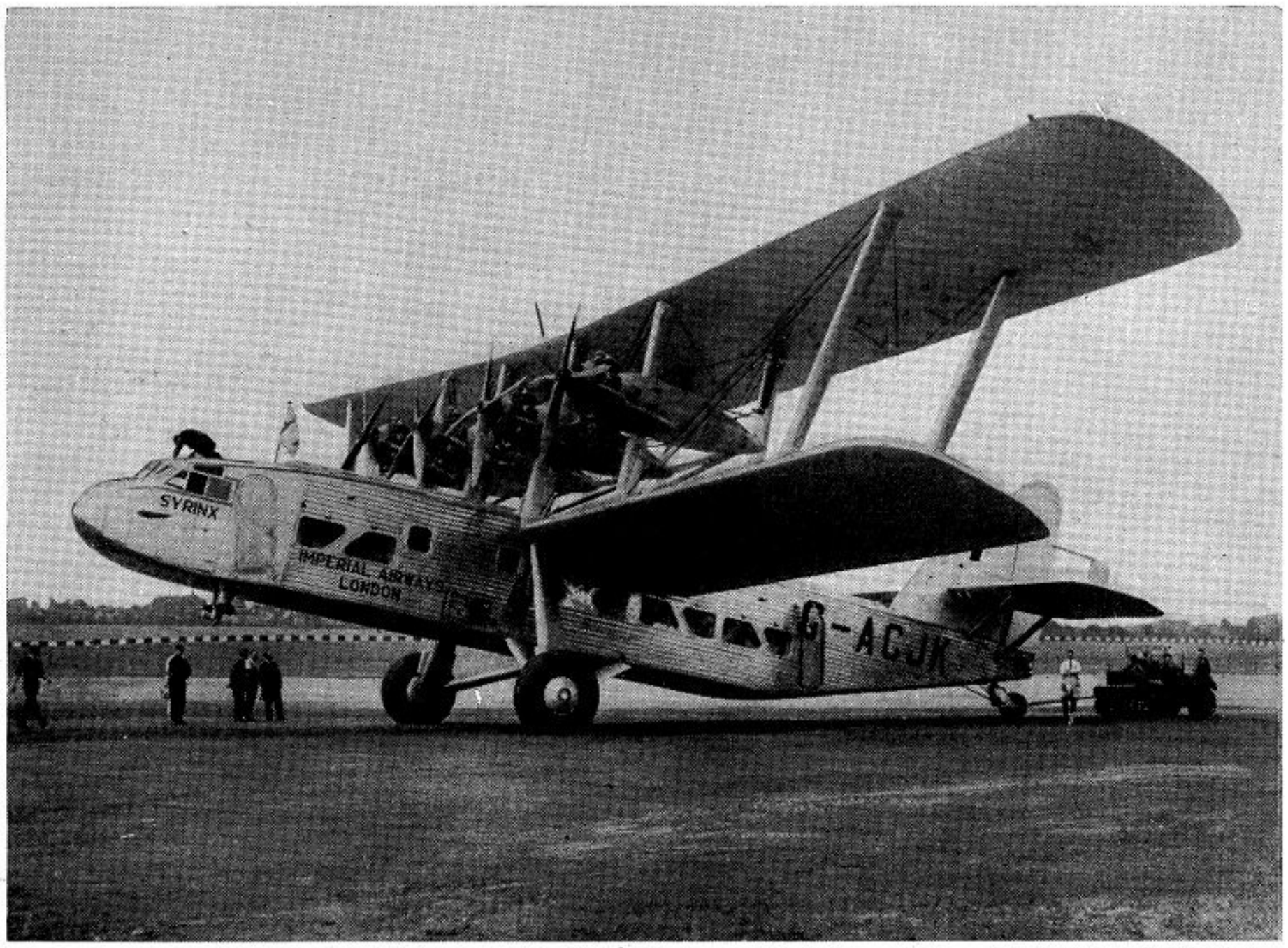
The Scylla type of Imperial Airways liners is provided with four engines of 555 horse-power each, carry a crew of four, and have luxurious accommodation for 39 passengers. Each of these liners weighs more than 14 tons when fully loaded.



The passenger flying into Croydon has this view of the main group of buildings which includes workshops and hangars for the planes and the administration buildings. The flat roofs provide excellent view points for visitors.

There are always scenes of great activity when the liners arrive, porters meeting them with trolleys on which luggage and other goods are taken into the Customs Office. Luggage, goods, and mails are carried in the rear portion of the machine.

THE AIRPORT BY DAY AND BY NIGHT



It is not at all easy to man-handle a big plane when it is on the ground, but the operation of moving the giant between its shed and the tarmac where passengers embark is rapidly accomplished with the help of a tiny but powerful tractor.

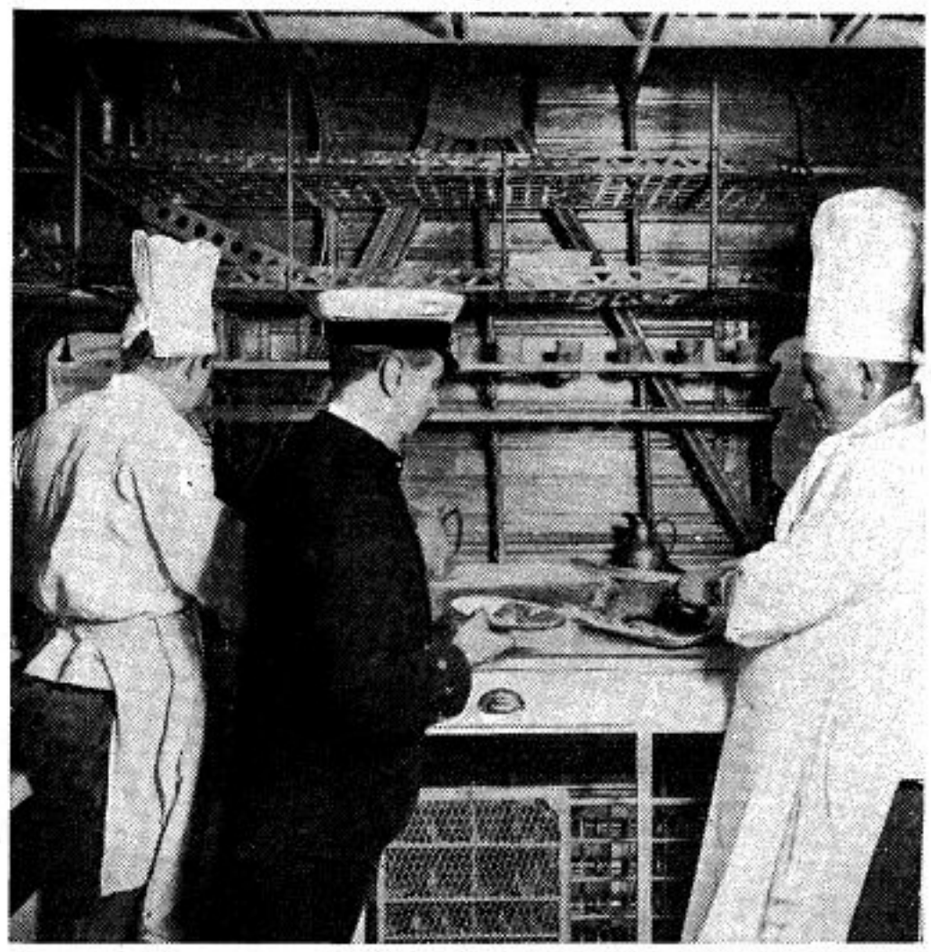
Night-flying has no terrors for the skilful pilot of a liner which is provided with several engines, for risks of a landing away from a properly equipped aerodrome are negligible. Here we see a liner arriving at Croydon after dark.

THE CAPTAIN BOARDS HIS LINER

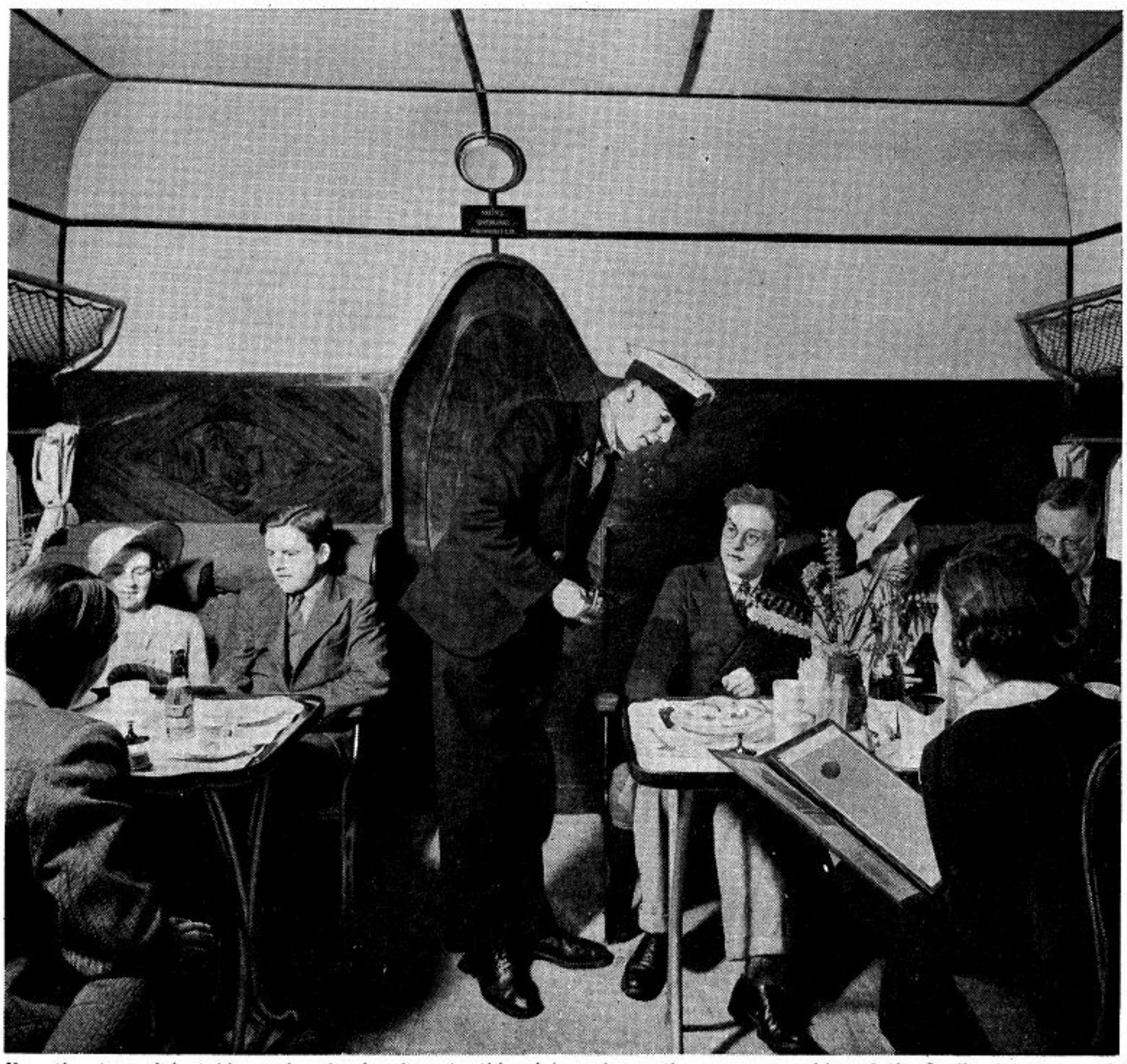
Air liners of today work to regular timetables, as liners of the shipping companies do, and shortly before the time of departure a tall flight of steps is wheeled to the nose of the machine to enable the captain to enter his compartment.

TIME FOR LUNCH ON THE AIRWAY

Many people regard air travel as the normal method of making long journeys. Here are passengers at Croydon, where hundreds of travellers are dealt with daily.

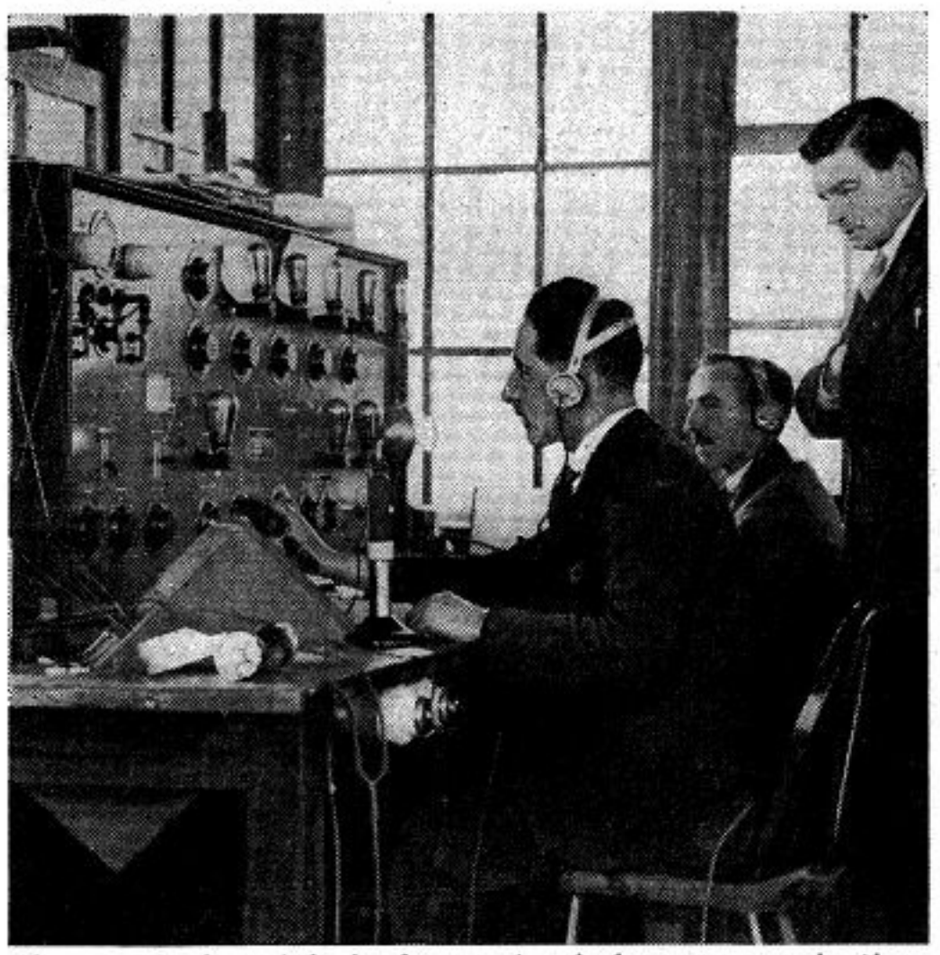


A kitchen is part of the equipment of some of the bigger liners, for meals are served during flight. This picture shows the little kitchen on board the Scylla.



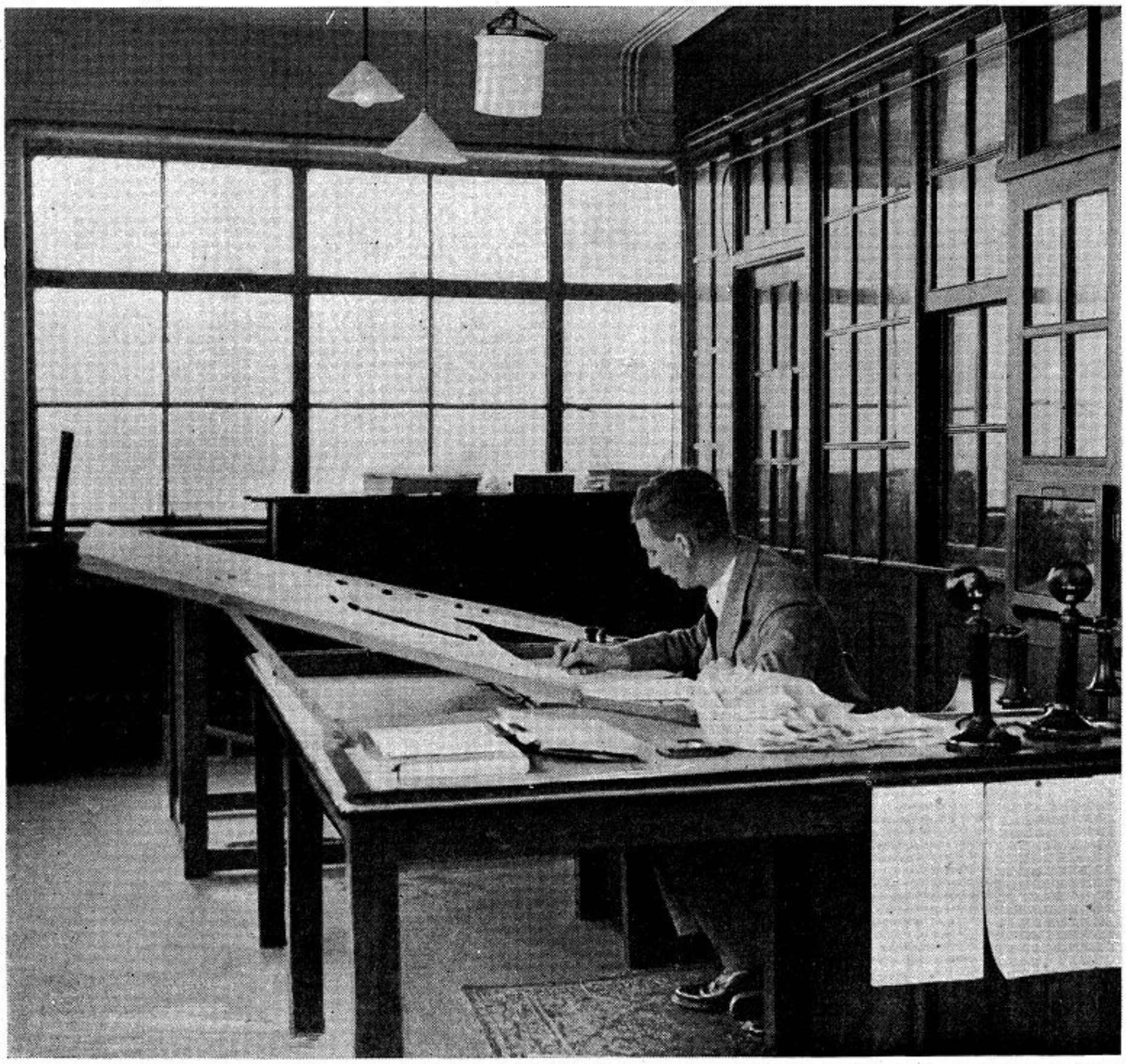
Here the steward is taking orders for lunch. As this picture shows, the passenger cabins of the Scylla class are much wider than the ordinary railway dining saloons. In this machine engine noises do not interfere with conversation.

IN THE CONTROL TOWER OF THE AIRPORT



The great airport is in frequent wireless communication with other air and meteorological stations and with machines in flight. Here are wireless operators at work.

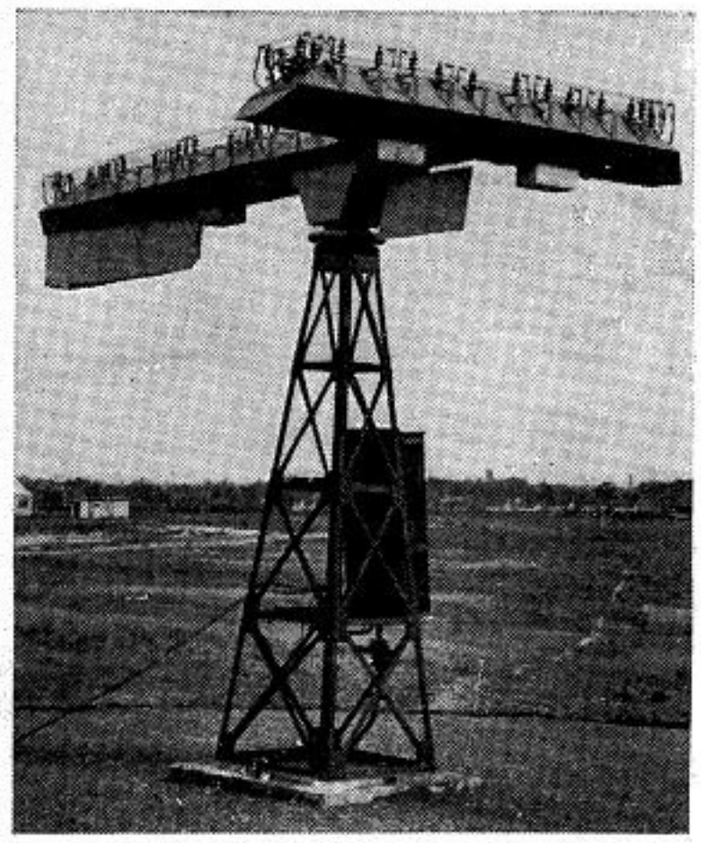
Before a plane may take off from the aerodrome it must receive a light signal to do so flashed by this lamp, which is sighted on the pilot, from the control tower.



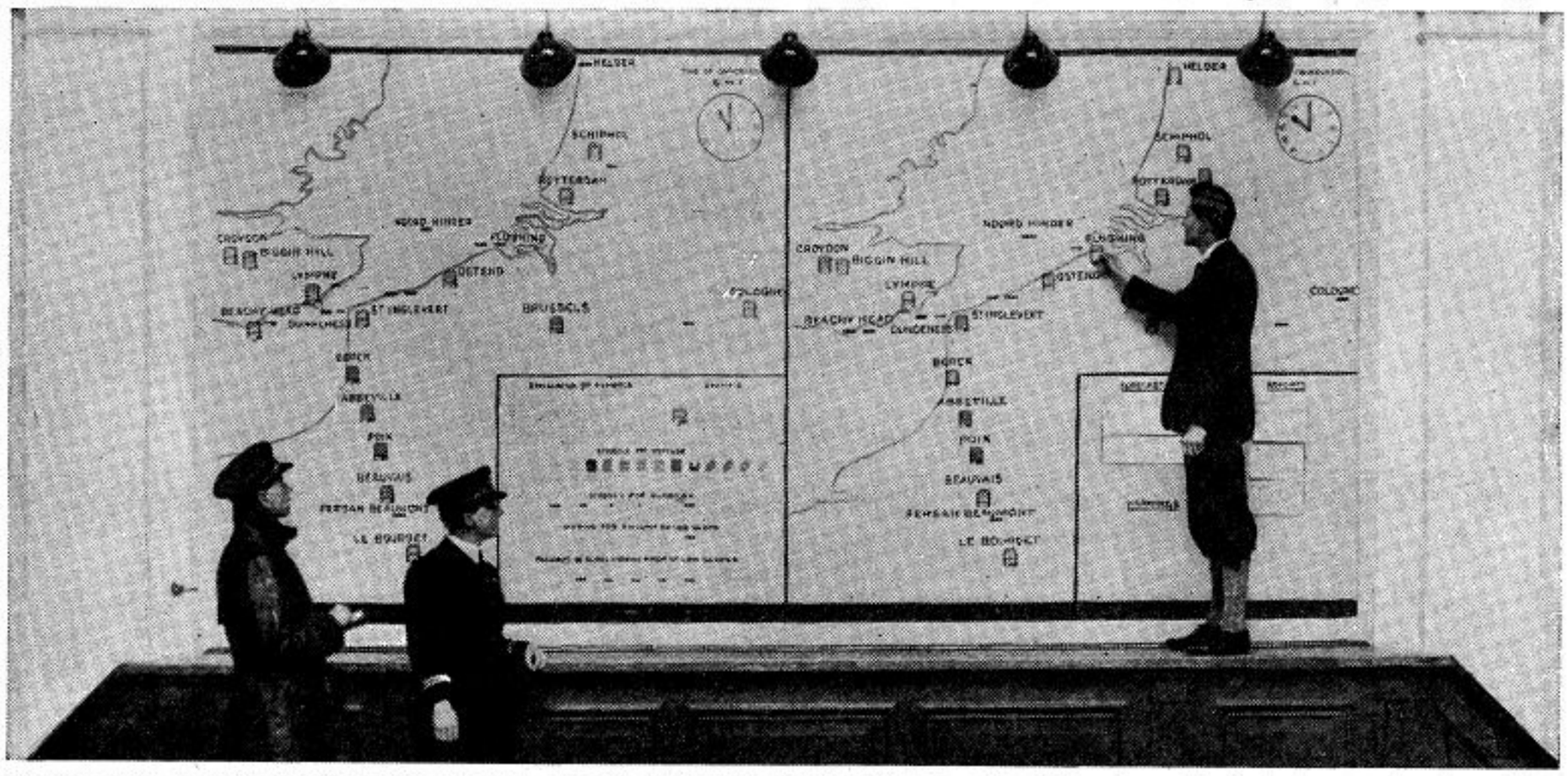
Wireless messages give the whereabouts of machines flying between London and the Continent, and it is the duty of the control officer to keep a note of their progress by marking their positions with little flags on a large map.

FIVE PEEPS AT A GREAT AIRPORT

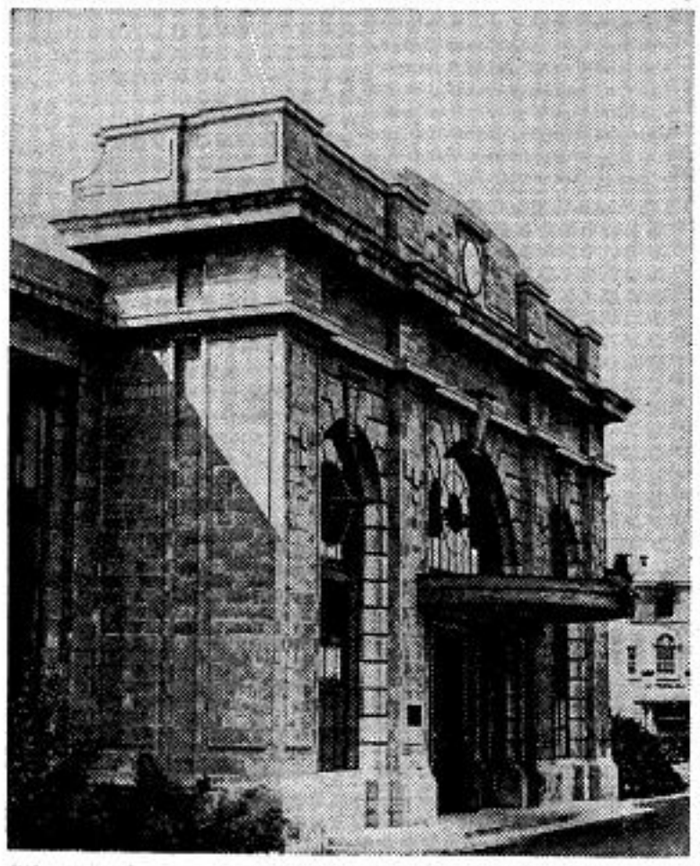
Here sacks of letters for destinations abroad are being transferred from one of the familiar blue air-mail vans to an air liner just before its departure.



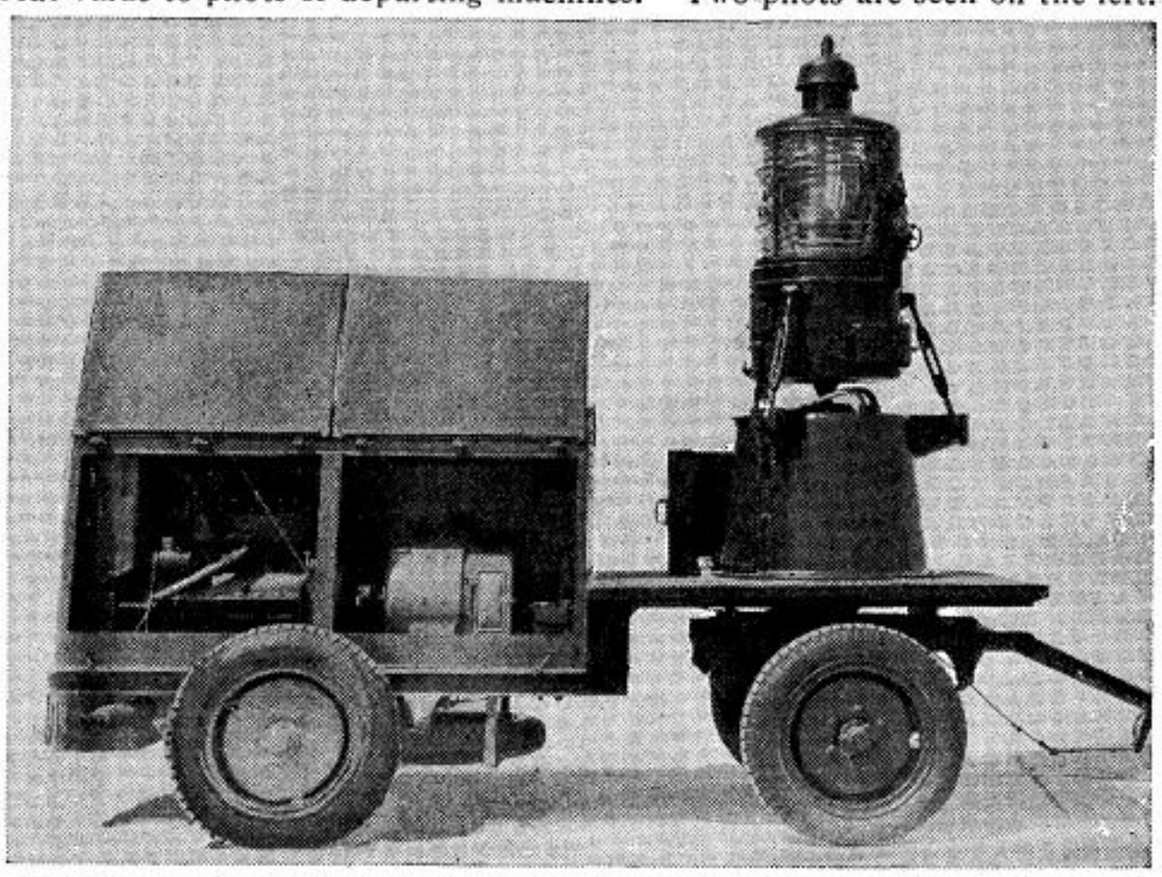
This T-shaped wind indicator illuminated with neon tubes helps pilots to land at night.



In the main booking-hall at Croydon is a large meteorological notice board which gives the latest reports of weather conditions on the air routes, information of great value to pilots of departing machines. Two pilots are seen on the left.



The main entrance of the air station, seen here, is very much like a railway terminus.



The landing-field can be brilliantly illuminated at night by a portable flood-light like that shown here, casting a beam of a million candle-power.

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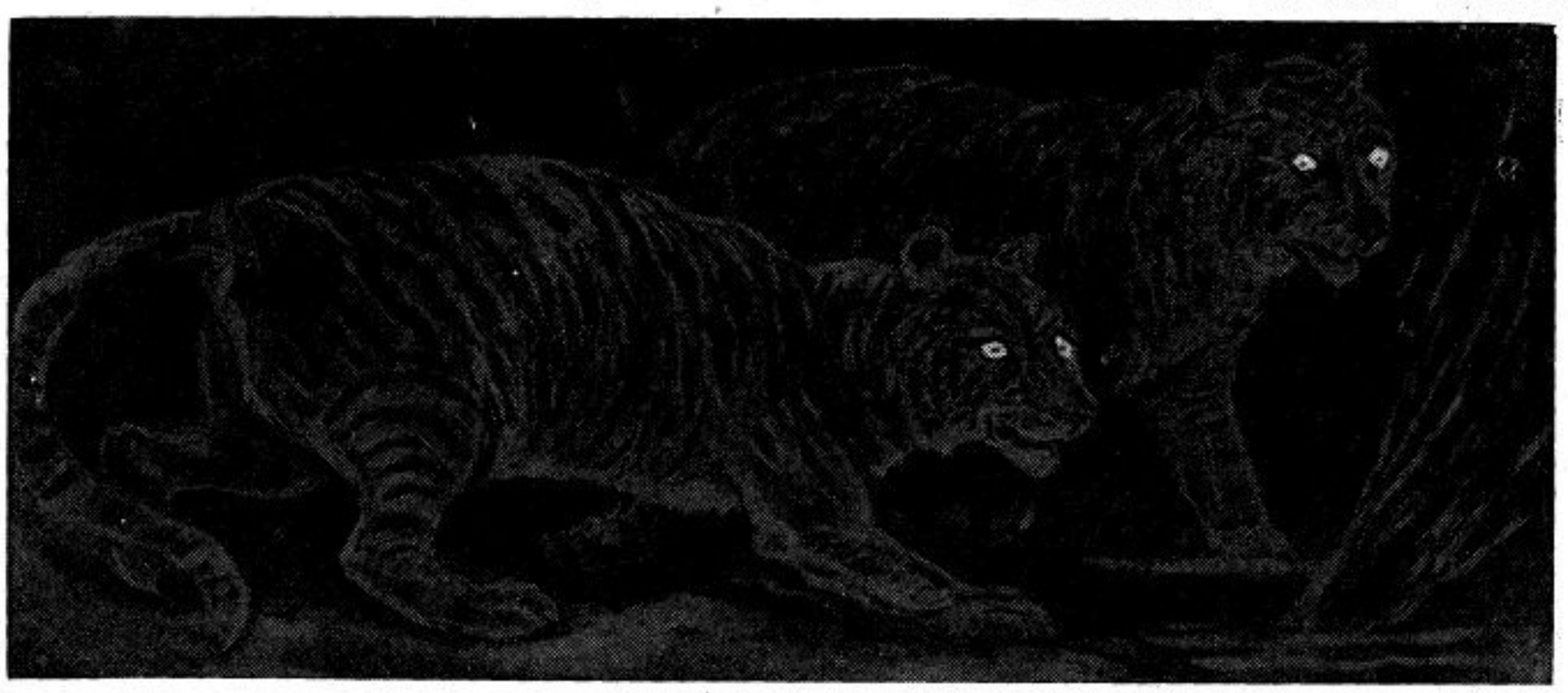
Plain Answers to the Questions of the Children of the World



WHY CAN'T I SEE IN THE DARK?

"THE dark" is the absence of light. Now, what is the name for the absence of sound? What do we call the state of things when we hear no sound? The answer is silence. Let us remember after this always to think of darkness and silence as if they were a pair of things. By darkness we mean the absence of light, just as silence is the absence of sound.

But there is more to say. There may be a wave motion in the ether, but it is hardly proper to call that light until someone sees it. Similarly there may be a wave movement in the air, but it is hardly proper to call that sound unless someone actually hears it.

Seeing and hearing, then, depend, first of all, on there being something outside of us—a particular kind of wave; and, secondly, on our being able to feel that something. In order to see, it must be there.

That is why we cannot see in the dark, because there is no light, and it is only light that we see. But, also, the seeing eye is necessary. A table in a dark room is there, though we cannot see it. There is no light, and so we see nothing. When we do see the table, as we say, we really see the light coming from it, and the form of the light tells us that the table is there. A blind man cannot see, even in the light. Our great poet Milton, in his poem on Samson, makes Samson say, when he had lost his sight:

"Oh, dark, dark, dark amid the blaze of noon!"

That famous line will help us to understand what darkness may depend on—either the absence of light, or the absence of the power to see light.

It is often supposed that cats and tigers can "see in the dark" but we must know that nobody at all can see if it is perfectly dark—that is to say, if there is no light at all coming from anywhere. When we speak of being in the dark we usually mean that there is so little light that we see hardly anything.

That is because our eyes are so made that they cannot alter themselves to suit the conditions of very dim light; but some animals can make the pupil of the eye so wide as to get the benefit of whatever rays of light are about. This is the case with cats, and if we watch the cat's eye when it is in the dark, we see that the pupil appears much enlarged. This allows all the light possible to enter the eye, and the cat, and other night-prowling animals that have eyes like the cat, are able to see very much better in dim light than we can. But even among human beings some people, especially seamen can see farther in the dark than others.

Can a Poisonous Snake Bite Without Poisoning?

Some can and some cannot. The way that poisonous snakes use their fangs to inject poison is one of the most wonderful things in Nature, and in the case of some of them—for instance, the common adder or viper, which lives all over Great Britain—this poison fang and its venom are only used as a means of self-defence, or for getting food.

But the adder as a rule does not use its poison fang when it bites the animal on which it feeds, and so it has a very curious arrangement, by means of which these fangs are laid flat back in the roof of the mouth out of the way of the ordinary teeth which are used for feeding. Thus the adder can use one or other sets of teeth just as it likes when it wishes to kill its foe, and it can tuck its fangs securely out of the way and use its ordinary teeth when it wishes to swallow food. In some of the other poisonous snakes the fangs are fixed, and cannot be used in this way.

What is a Mirage?

A mirage is an optical illusion due to certain atmospheric conditions. It occurs especially in certain conditions of the air when the air is very hot.

Sometimes in deserts there are spots called oases, where there is water, and, as there is water, there are also green trees and shade. We are told that sometimes travellers think they are coming to an oasis only a few miles away, where they can get water and shade; and then, as they travel on, it disappears. A great explorer once "discovered" and named a mountain which did not exist, but which he had seen as a mirage.

But a true mirage is not an appearance in the sky due to nothing at all, and it is not pure imagination on the part of those who see it. When the traveller sees an oasis in the desert, and it fades and deceives him, what he has seen is the image of a real oasis, much farther on, below the horizon. The light from the real oasis has been reflected from a layer of air, as we see in the picture on page 441, and the traveller sees it as if there were a huge mirror in the sky placed at such an angle as to give a view of the oasis to the traveller's eyes.

The reason of this is that there are layers of air of different temperatures, and therefore of different density, and whenever light passes from one thing into another of different density, part of it does not go on, but is deflected back. Appearances due to a similar cause are often seen at sea. A ship near the horizon may seem to have another ship, exactly like itself, perched upside down upon it.

Why Do Empty Vessels Sound More Than Full Ones?

In the study of sound we soon discover the existence of things which help to magnify a sound. The virtue of these things is that they resound, and so they are called *resonators*. The body of a violin is a resonator, and so are our chests and the spaces of the mouth and nose when we sing. If we play a violin from which the body has been taken away, the sound is weak, and thin, and ugly, and the difference between a violin worth £2000 and one that is not worth £5 is to be found in the body, or resonator.

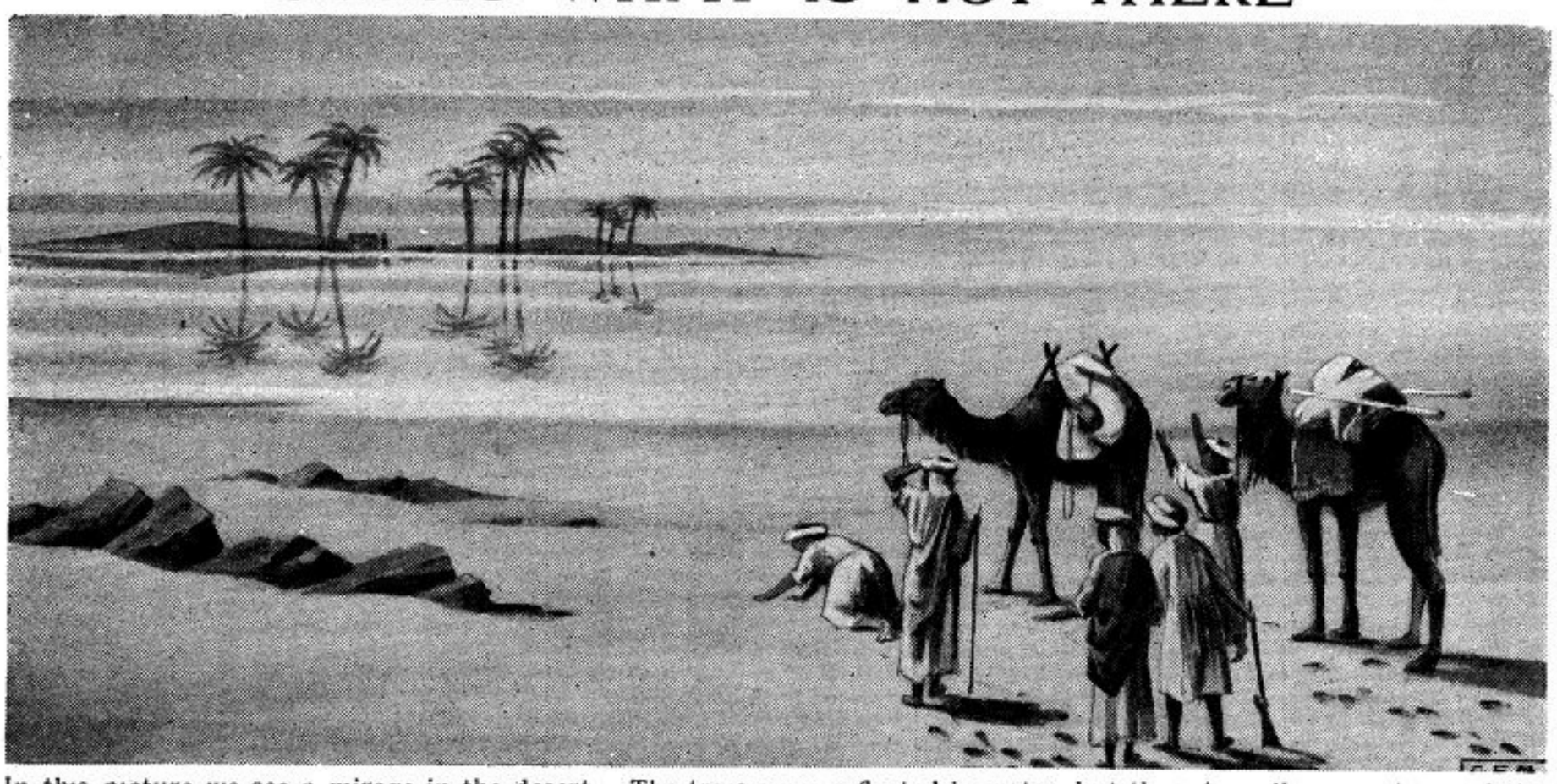
The whole point about a resonator is that the air inside it can be thrown by it into sound-waves. If there is no air inside it, of course its use is gone. An empty vessel is a resonator. If it is filled with fluid, it can no longer act; it makes far less sound, and the weight of the fluid quickly stops what sound it does make, acting like the dampers in a piano. If we were to fill the body of a violin with water, we should get the same result as if we held the body of a violin tightly in our hand when playing it.

Do Animals Know When They Are Being Treated Kindly?

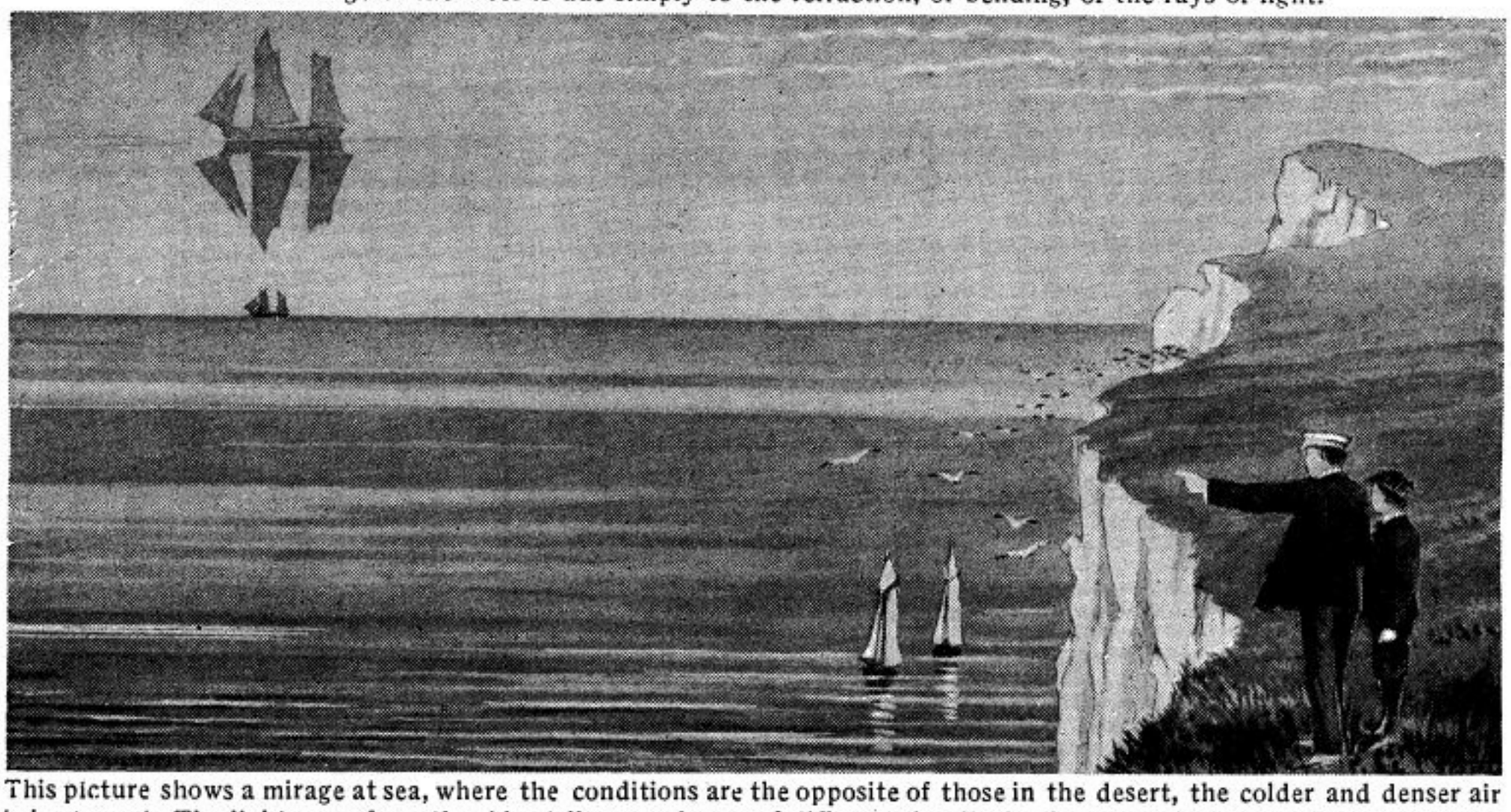
Not even the wisest man can tell you how much animals know and how much they do not know, and it is still more difficult to say how much they can appreciate; but what we do know is that all the animals that man makes use of, or lives much with, can feel pain very readily, and are capable of great suffering. Whether they know they are feeling it is a different matter, much too deep a question for us here.

But the most important point about this subject is this—that whether animals appreciate kindness intelligently or not, it makes a very great difference to the human being who treats his animals well. No one who is cruel or unkind to animals will be kind to his fellow-creatures, and therefore we should always try and treat animals as kindly as one of ourselves, so that we may grow kind to all living things.

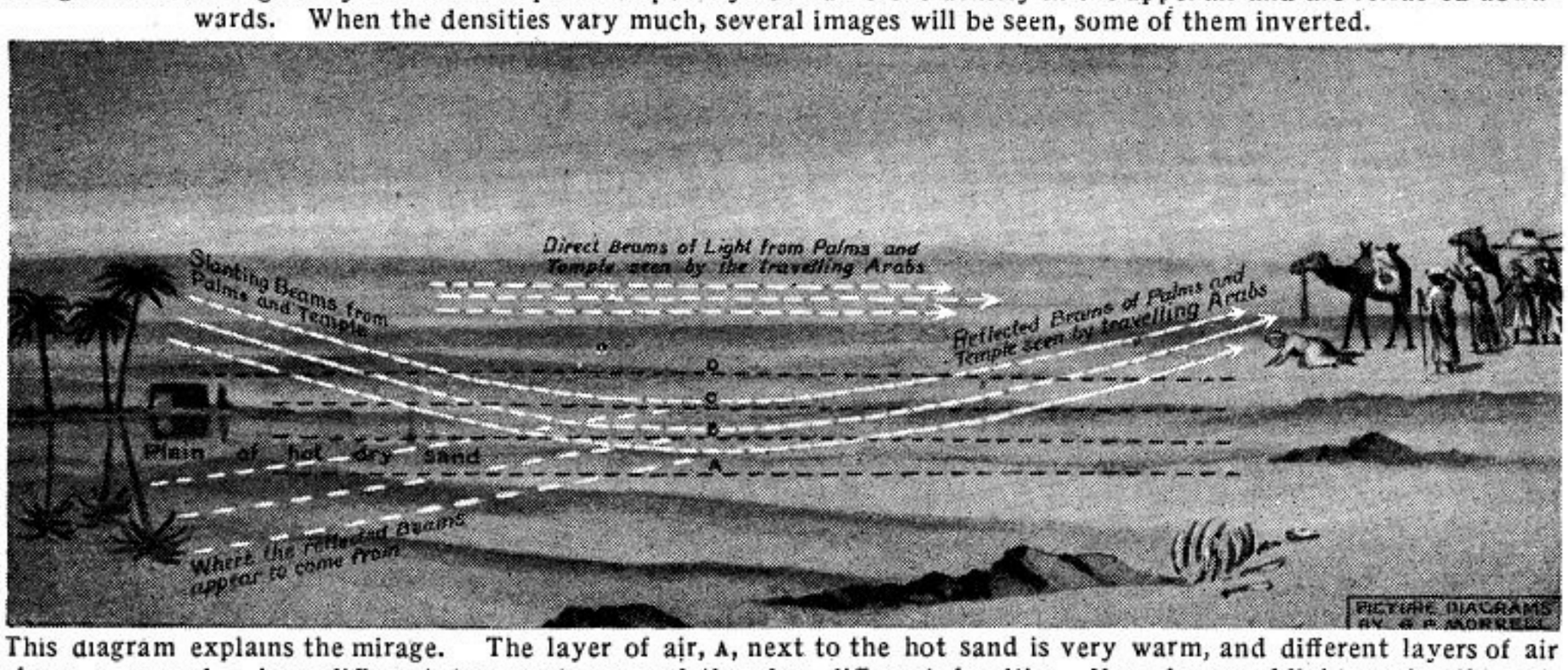
SEEING WHAT IS NOT THERE



In this picture we see a mirage in the desert. The trees seem reflected in water, but there is really no water, and the inverted image of the trees is due simply to the refraction, or bending, of the rays of light.



This picture shows a mirage at sea, where the conditions are the opposite of those in the desert, the colder and denser air being lowest. The light rays from the ship strike upon layers of different density in the upper air and are refracted downwards. When the densities vary much, several images will be seen, some of them inverted.


Direct Beams of Light from Palms and Temple seen by the travelling Arabs
Slanting Beams from Palms and Temple
Reflected Beams of Palms and Temple seen by travelling Arabs
D
C
B
A
Plain of hot dry sand
Where the reflected Beams appear to come from
PICTURE DIAGRAMS BY G. F. MORRELL

This diagram explains the mirage. The layer of air, A, next to the hot sand is very warm, and different layers of air above, B, C, and D, have different temperatures, and therefore different densities. Now, beams of light passing through gases of different densities are refracted, or bent, in varying degrees, and, as shown here, the trees, as well as being seen by direct beams, are seen also by the reflected beams as if reflected by water.

What Makes the Earth Quake?

The first reason that probably accounts for all earthquakes is simply that the Earth is shrinking as it gradually loses the heat from its surface. We know that the Earth has a very thin crust, which is comparatively cool, and a very hot inside. The crust rests upon the inside of the Earth, and as the inside shrinks it is bound to leave parts of the crust unsupported, so that they are apt to sink or crack. This will happen especially where the crust of the Earth is thinner and more liable to crack than in other places. It is very common in Japan, for instance, and very rare in England. Not many years ago there were, within a few months, not less than a thousand small earthquakes in New Zealand.

But when an earthquake happens at any part of the Earth it starts a wave of disturbance that travels right over the Earth, and can be detected anywhere if we look out for it. Then, if we notice the time when the wave reached a place, and find out what the time was when it started, we can learn how quickly the earth-wave travels. But sometimes no one knows where the wave started, and then very often we can guess that it started under the sea; for earthquakes may start in the Earth's crust where it forms the beds of great oceans as well as anywhere else.

When I Walk in a Moving Train Do I Move Faster than the Train?

We ought to know which way you are walking. The answer to the question is yes, if you are walking in the direction that the train is going. But if you are walking from the front of the train to the back, then you are moving more slowly than the train. There can be no doubt about it, for you can prove it by experiment, that is, by trying.

If two of you got into the back of the train when it started, and one of you walked right through the train, if he could, to the front, then when the train stopped, he would get out on the platform much farther forward than the other. He would have travelled farther in the same time than his friend, and farther than the part of the train his friend was in, and thus farther than any part of the train. He has added his own movement compared with that of the train to the movement of the train compared with that of the Earth.

The Earth is moving too, and if the train is moving on the Earth in the same direction as the Earth is moving through space, then the train is moving through space faster than the Earth. And if you are walking from the back of the train to the front, you are travelling through space faster than the train, and still faster than the Earth. And if a fly is walking across your cheek from your ear to your nose it is travelling through space faster than you, or the train, or the Earth!

Does the Brain Need Food?

The brain is made of nerves and nerve-cells. These taken together we call nervous tissue, and we know that nervous tissue is more richly supplied with blood than any other tissue in the body, not even excepting the muscle tissue of the heart itself. The blood carries the food materials without which nerve tissue cannot act, and nerve tissue has practically no reserve at all of food supply in it. If the supply of blood is stopped for a moment, nervous tissue gives out sooner than any other tissue in the body.

A simple and wonderful little experiment will show you this for yourself. The screen or curtain at the back of your eye, which receives the rays of light from everything you see, is made of nervous tissue. It is packed with blood-vessels. If you shut one eye and look out of the other, and then press your finger firmly on the open eye (pressing on it through the lid), in three or four seconds everything will grow quite dark. The eye is open and there is plenty of light, but it is quite blind. Move your finger away and in a second or two you will see again. The reason is that when you pressed on your eye-ball you prevented the blood running through the screen or curtain at the back of the eye, and after about two seconds, during which it was using up what it had taken from the blood, it could do no more, and your eye became blind.

Is Every Seventh Wave a Bigger One?

No. Another superstition we may add to this is one which says that every third or every ninth wave, when the tide comes in, is bigger than the others. It is untrue and without any basis of fact. Most of these assertions about three and seven are nonsense, and are derived from long ago, when those numbers were thought to have some special value in Nature.

A decorative mosaic from an old castle in Sicily

A GREAT LIGHT SHINES

THE dying out of classic art left the world cold and bare, and something like ten centuries were to pass before a new glory rose on the ashes of the old. Meanwhile, in an obscure corner of Asia Minor, the greatest event of the world's history had taken place—the birth of Jesus at Bethlehem. Let us think of the influence of Bethlehem on the fortunes of those days. It was the shining of a great light for Art.

For many generations Christianity had no real home, but was the guest of several countries and states. It was impossible for a people so scattered to have in themselves the dominant power which produced the art of Egypt, Assyria, or Greece; it was equally impossible to be neighbours to such greatness without copying it.

In early Christian art, therefore, it is natural that certain influences should be traced—Greek, Syrian, and to some extent Persian.

Alexandria was at that time the centre of Greek painting, and although the Grecian genius was worn out, and its ideals rather battered, it still had command of technique, and was able to give valuable lessons to a new art. Greek painters taught the Christians how to fill spaces, and group figures and ornament. The secret of great composition—the avoidance of overcrowding—was still a part of the Greek tradition, but the early Christian artists, like the Romans, failed to learn this lesson. To its dying day, the spirit of Greek art was beauty for beauty's sake. A very different purpose underlay Syrian art.

The Syrians were less interested in their painting than in the subjects they portrayed. It was their instinct to represent the gentle Jesus as an arrogant figure, tinged with the egotism of the Egyptian and Assyrian art of which the Syrians themselves were heirs. The Founder of their religion was always in a central position, and drawn on a larger scale than any other figure. We can always trace this Eastern influence, so contrary to Greek ideals, when we see pictures by the early Christians painted in what is called *inverted perspective*.

This peculiar treatment showed the foreground figures, which should have been larger than the rest, actually smaller, so that the Christ in the middle of the composition might stand out more convincingly. The Syrians, in a word, did not paint pictures as pictures; they merely illustrated an idea in colour and shape; their art was the expression of their religious thought.

The Persians, on the other hand, who also had an effect on this new art, were without any sense of perspective whatever. In its place they adopted a curious convention. Their compositions of groups

of people show figures always painted in flat tints, with no attempt at modelling, no rendering of a background. And, in order to show that some persons were nearer the front of the picture than others, they painted figures in zones or layers, one set above another ; the highest group in the picture was supposed to be in the farthest background. The Persian strain in early Christian art is shown mainly in this strange un-lifelikeness and in the introduction of a certain kind of ornament—a conventional scroll of vine leaves and branches wherein birds and beasts are most incongruously set.

PICTURES IN THE MEETING-HALLS OF THE FIRST CHRISTIANS

Generally speaking, Christian art of the first few centuries was divided into two branches, that of the western world, centring in Rome and Ravenna, and that of the eastern world, centring in Constantinople. The Constantinople school is known as Byzantine, and takes its name from Byzantium, the ancient name for Constantinople, which the Christian Emperor Constantine, in the fourth century, made the new capital of the Roman Empire.

Traces of the work of early Christian artists, gold and enamel objects, and pottery, have been discovered in most of the Mediterranean cities. The chief monument to their art is found in the wall paintings of the catacombs during the first four centuries. These were burial places, and, in the years of their persecution, the secret meeting-halls of the followers of Jesus. Catacombs were known to exist in Naples, Syracuse, Alexandria, Cyrene, and the Holy Land. The most famous are at Rome, where about fifty have been discovered from time to time.

THE UNDERGROUND GALLERIES WITH THE SECRET ENTRANCES

The Christians, like the Romans, built their catacombs outside the city wall, on the great high-roads that led from Rome to the outer parts of the Empire. Some of them lie in the famous Appian Way ; one of these, the catacomb of St. Domitilla, is supposed to be the most ancient.

The catacombs were long, narrow, subterranean galleries, with recesses and small chambers breaking their gloomy lines. They formed a network of underground galleries, and when, during the bitterest spell of their persecution, the emperor Diocletian ordered the catacombs to be closed, the Christians burrowed fresh entrances and made new and mysterious passages whose winding mazes were known only to themselves.

As time went on, the existing catacombs proved in some cases insufficient for needs of burial. The workmen then sank shafts until they found a lower stratum suitable for excavations ; when those galleries became surcharged with their ghostly burdens they found another stratum, and another. Visitors can still go from one to the other of the four floors of the catacomb of St. Calixtus.

In the walls of the catacombs horizontal, rectangular spaces were cut for the reception of the dead, and afterwards closed by marble slabs. At a later period it was the habit to place beautifully chiselled stone coffins in these niches. When the " peace of the Church " came with the reign of Constantine, the practice of burying the dead in catacombs ceased. Cemeteries and chapels were made, and the underground galleries and chambers became meeting places for the cult of martyr worship which arose. In later centuries the catacombs ceased to have this hold on the Christian community, and they became merely a dim tradition.

HOW THE CATACOMBS WERE LOST FOR AGES AND FOUND AGAIN

Medieval pilgrims who walked across Europe to the Eternal City used to visit a catacomb in the Appian Way, near the little church of St. Sebastian, but for the most part the ancient burial-places were forgotten. Late in the sixteenth century the accidental falling of a vault laid bare some wall-paintings, and these excited the interest of archaeologists. Most of the catacombs have since been excavated, and thus a period of remote Christian history of unparalleled interest comes to light.

In spite of the dim light and most unpleasant and foul air, the chambers and recesses of the catacombs were decorated. Some of the wealthiest families of Rome were Christian, and spared no pains or expense in making beautiful the halls of their dead. The Christian religion had taught them that death is the least misadventure which can befall a man, and thus there was nothing morbid in their interest and devotion to this mural art. Just as in Syrian paintings it seemed that the artists were speaking aloud, saying a tremendous creed about a Great and Jealous I AM, so in the timid, shy art of the catacombs it seemed that the artists

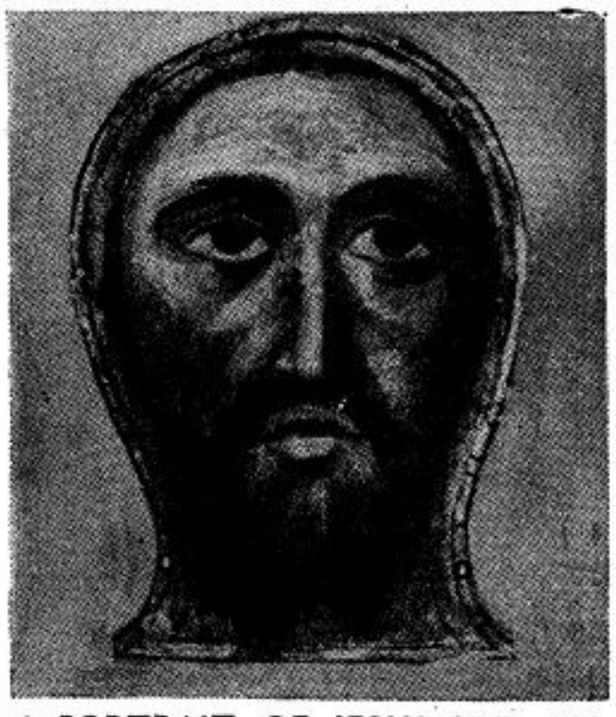
PICTURES ON THE WALLS OF LONG AGO

A SPLENDID RAVENNA MOSAIC OF THE SIXTH CENTURY

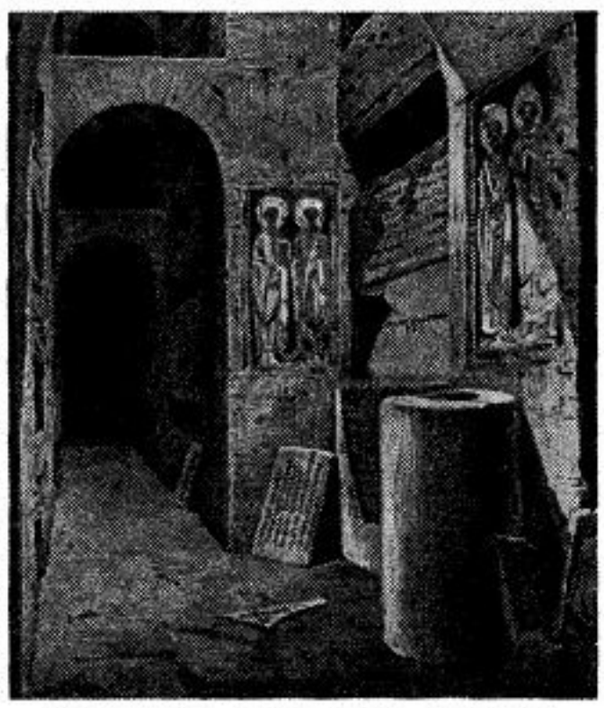
SAINT MICHAEL IN AN OLD MOSAIC

FIGURES FROM THE WONDERFUL MOSAIC WALLS OF SAINT MARKS, VENICE

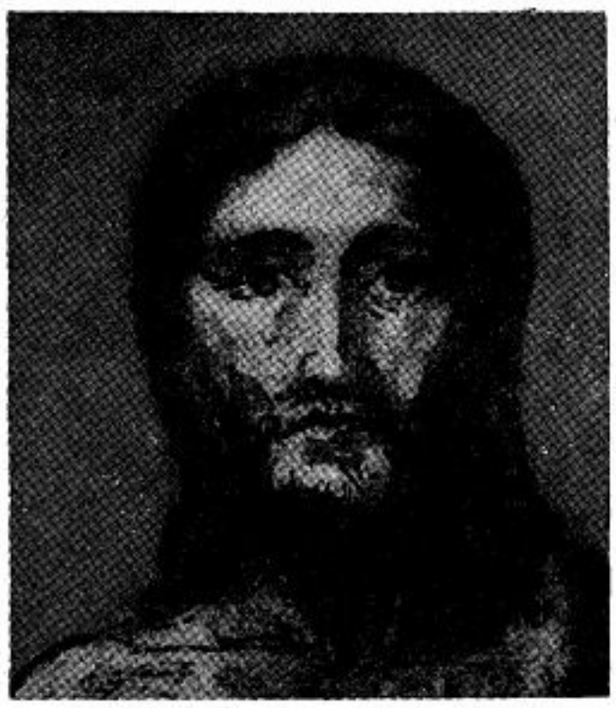
FROM A MOSAIC OF THE SIXTH CENTURY



A PORTRAIT OF JESUS SAID TO BE BY SAINT LUKE



PICTURES ON THE WALLS OF A CATACOMB IN ROME



A PORTRAIT OF JESUS IN THE CATACOMB OF ST. CALIXTUS

were praying aloud and holding communion with their beloved dead in Paradise.

There is nothing of outstanding merit in the paintings of the catacombs, but looked at now across a span of about twenty centuries one can see in those dark, underground places the first blossoming of the eternal spring-tide and hope and Christianity, the spirit of the One who said, " Behold, I make all things new."

This " joyful sorrow " for those who had found a happier home was never far from the thoughts of the Christian artists ; and so they painted dainty friezes of peacocks, typifying eternity ; trees which meant the garden of Paradise ; the turtle dove—the picture of the soul at peace ; the lyre—signifying the divine word. It was the early Christians who inscribed on their tombs that most beautiful phrase—*Sit tibi terra levis*—" May the earth rest lightly on thee "—a whole poem in one line.

The Roman catacomb decoration of the first century was chiefly of this delicate, lyrical kind—symbols, floral designs, vine tendrils. At first only the walls were painted. In the second century the treatment of the figure in design appears, the walls were set apart for subject paintings, and the daintier symbolic work was in a very literal sense skied—reserved for the ceilings of the chambers.

THE FIRST PICTURES IN THE WORLD OF MARY AND JESUS

Some of these ceiling decorations are a delightful mixture of paganism and Christianity. On the roof of the catacomb of Lucina a delicate geometric pattern appears, with tiny figures subjugated to the lines of ornament. Looked at casually, it might seem to be a repeat on a ceiling paper in our grandmothers' houses ; closely examined, it reveals a figure of the Good Shepherd in the centre, persons representing the four seasons at corners of the design, and little heads and praying figures set round about which appear very Greek in their treatment. Another ceiling decoration—the famous catacomb of St. Calixtus—shows Orpheus with his lute in the centre, surrounded by small Scriptural groups, such as the raising of Lazarus, Moses drawing water from the rock, Daniel in the lions' den. This same catacomb of St. Calixtus has excellent examples of the wall-work of the early artists.

In the catacombs we find the first of the innumerable representations of the Madonna and Child which Christian art has given to the world. These pictures are very simple, and, as in the case of the paintings of Christ himself, are not in any sense portraits. Mary is shown as an ordinary Roman woman with her baby. In the early paintings Jesus has the appearance of a Greek youth. The traditional bearded face in the pictures of Christ dates from a later time.

CHRISTIANITY SET FREE BRINGS ABOUT A CHANGE IN ART

The art of the catacombs was a mere apprenticeship, leading up to the important work which followed when Christianity became a great power. In the fourth century. Constantine issued an edict giving full liberty to the followers of Jesus, and permission to build churches. The Christians had been waiting for this ; their faith had assured them of ultimate freedom ; their suppressed activities blazed into life. As we look back on these early centuries it almost seems that we can watch the actual progress of Christian art as of a living thing.

Within a few years of her release from suppression, Christianity had evolved a church entirely unlike any other religious building in existence, and lavished a wealth of beauty on its decoration. In two hundred years or so art in Italy developed on these lines. During that time the centre of progress had moved from Rome to Constantinople, and the splendour of Byzantine art arose, to find its culmination in the church of St. Sophia, which is one of the miracles of the world.

While thus the art of church decoration became a great force, the quality of Christian art, the motives which had inspired it, had changed. The spiritual feeling of the catacomb pictures, born in a period of persecution and humility, gave place to the proud glorification of Jesus, Mary, and the Saints. The artists were no longer praying aloud, they were singing the songs of the Church triumphant.

THE GREAT THING THE FIRST CHRISTIAN ARTISTS DID

Paintings in fresco and coloured friezes were not rich enough as a medium for this glorious sentiment ; the artists began to make pictures in mosaic—in small squares of gold and coloured glass embedded in cement. Only in the less important churches did wall-painting continue.

The Romans had learned the art of mosaic work from the Greeks, and had used it beautifully in their pavements. The

THE ARTISTS IN THE EARLY CHURCHES

A MOSAIC FIGURE OF THE VIRGIN IN SAINT MARK'S, VENICE

MARY AND JESUS—A MOSAIC IN THE CHURCH OF SAINT GREGORY, MESSINA

A SEVEN-CENTURY-OLD MOSAIC IN SAINT MARK'S, VENICE

Christians took up mosaic work at this point—that is to say, their first mosaic pictures were executed in colours on a white ground, after the manner of the Italian floor mosaics. Very soon, however, they obtained a style of their own, and a mastery of technique; in two or three centuries they evolved a distinctive and wonderful scheme of decoration.

THE SHINING COLOUR OF THE BYZANTINE ARTISTS REACHES ITALY

The early churches were peculiarly adapted for this wealth of colour display. They were huge buildings, erected, with certain adaptations, on the plan of the Roman basilica—a large hall for public gatherings. Their lines were long and straight, their weight more horizontal than perpendicular; the exteriors were severely plain, and the interiors unhampered by any breaks in the walls. Rome and Ravenna were the home of the most famous basilican churches. Several were built by Constantine himself.

We can faintly surmise how beautiful their interiors must originally have been, what a glory of shining colour must have mapped the walls, from the mosaics which still exist. On some of them time has laid a ravaging hand; many have been destroyed by fire; those that remain mark a period in the development of Christian art. When the tide of progress had set toward the Byzantine shore, a backwash touched the ground of Italy, and for two or three hundred years an art flourished that was half Italian and half Byzantine. We can trace the curious development from the basilican structures of this time in many Italian towns, such as Milan and Brescia, but chiefly in Ravenna, which during the sixth century became really a Byzantine city.

THE LIGHT FROM THE EAST THAT SPREAD ITSELF IN THE WEST

It would seem that the mosaics in the basilicas showed almost at once that tendency toward the Eastern influence in Christian art which was to become so marked in the Byzantine churches. Just for a short time there was the artless mixture of paganism and Christianity noticeable in the catacomb paintings. There is, for instance, a beautiful narrow frieze in the architecture of the nave in St. Maria Maggiore, Rome. The mosaic is blue and red on a gold ground and it shows a long spiral design based on the acanthus. Little doves flutter through the classic ornament; every now and then the design breaks and there is a white lamb standing alone—the symbol of Christ. A great many of these mosaics proclaim that Western Christian art was born in a land saturated with classic influence.

Very soon, however, the work was given up more to religious subjects, and the art native of Italy showed itself only in the border-friezes and curious garlands which the mosaic-makers crowded in abundance about their figures.

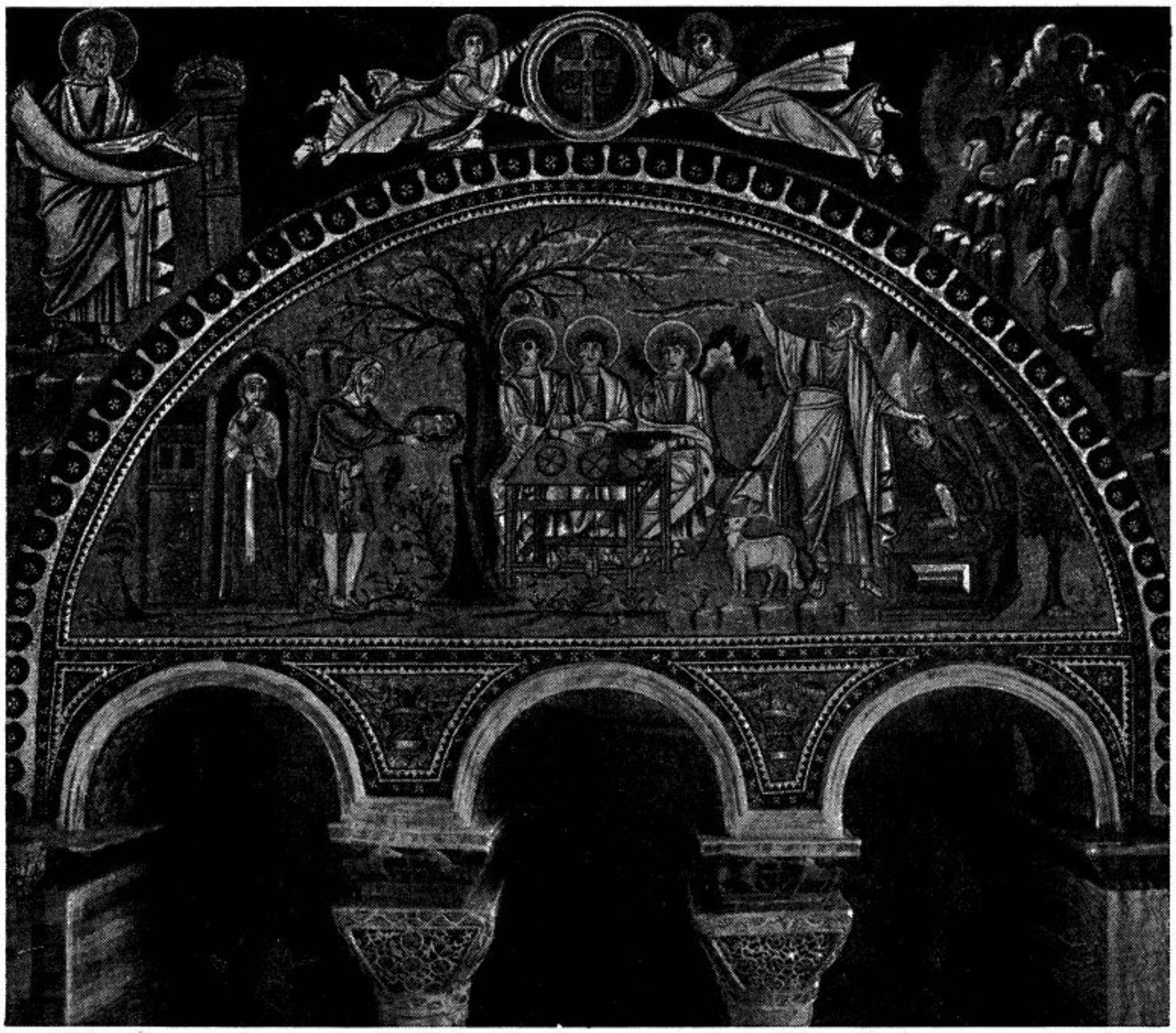
The growing Eastern influence in Christian art showed itself in several ways. The Syrian idea of a magnificent deity crept into the work, and we see Christ enthroned on a shining seat beneath a cross sparkling with jewels, Christ between Peter and Paul, Christ between the old law and the new, Christ surrounded by hosts of shining ones. But, generally speaking, the chief characteristic of the mosaics of the Christian churches, Italian and Byzantine, was a kind of narrative art—stories told in colour. The walls are unending illustrations of the history of the Church, the life of its Founder, and tales from the Old Testament.

THE MOSAIC-LIKE JEWELS AND THE CHURCH'S CROWN OF GLORY

So real was this instinct to preach, to declare a creed from the structure itself, that the art of the churches developed a scheme of ornamentation. The dome was usually set aside for paintings of a visionary nature, and the body of the church for more earthly subjects. From this grew the idea of portraying Christ in the crown of the dome with heavenly legions of angels and archangels ranked around. In the apse the Virgin was generally shown and subjects connected with the sacraments of the Church. The upper walls of the nave were set apart for figures from Old Testament history and scenes from the life of Jesus.

The mosaics were not ordinary pictures. Artists took advantage of the fact that they were dealing in a very artificial medium to fill in spaces with wedges of colour and brilliance. They were not content to place isolated panels or circular decorations in the sacred halls; they literally filled them with mosaic following the lines of the arches, and running up to the roof. The work reached its height in the jewel-like mosaics of the later Byzantine churches which sprang up; its crown of glory was St. Sophia in Constantinople.

This very brilliance was presently the death of Byzantine art. The life it should have portrayed became pomp and glitter, Oriental pageantry and display. Convention overrode beauty, and mural decoration of the church, which had begun in the mysticism of the catacomb paintings and grown to the imagery of the basilicas, became under later Byzantine sway a mere mass of gorgeous but petrified ornament.



HOW THE FIRST CHURCHES WERE DECORATED FOURTEEN CENTURIES AGO—A MOSAIC IN THE CHURCH OF SAN VITALE, RAVENNA

In the meantime, although early Christian art was centred in Italy and Byzantium, the religion had spread over Europe, founding a new civilisation. North of the Alps, after the reign of Charlemagne, this spiritual force found its expression in a new class of architecture. The timber-roofed structure of the south gave way to vaulted buildings called Romanesque. The churches of this period stand midway between the severe basilicas and heavy Byzantine and the upward-reaching, airy Gothic which was to transform Medieval Europe. A great many beautiful Romanesque churches were built in France; the oldest and most famous lie south of the River Loire. In England the Romanesque tradition, taking root with the Norman Conquest, gave rise to another kind of architecture adapted to the island genius. These new buildings were known as Norman, to distinguish them from the earlier Saxon edifices.

The Gothic style followed hard on the heels of the Romanesque. By the twelfth century it was established in England and France; by the thirteenth in Germany. With it came an instinct for internal decoration on the lines of sculptured figures and reliefs. The reason for this change was that the Romanesque churches had proved unsuitable for wall-paintings or mosaics, owing to their bad system of lighting, and the lines of Gothic buildings did not lend themselves to long friezes.

Of the Romanesque wall-paintings only a few fragments remain. A fine example is in the church of St. Savin, in Poitou, France; another in St. George's Church at Oberzell, on the Reichenau Island on Lake Constance. There is a beautiful painted altar-panel in the Münster Museum; another in the Berlin Museum.

By a pleasant exchange, as the art of wall-painting died out, that of window-staining arose, and enriched the churches with a shadow of the Byzantine brilliance. A school of coloured glass painters grew and reached its highest power in the thirteenth century.

Side by side with this smaller branch of religious art was growing another—the illumination of manuscripts.

From about the first century of our era, books were made of sheets of vellum—a fine parchment, originally made from calf-skin—beautifully and marvellously inscribed. There was no limit to the loving and laborious care spent on these manuscripts. Some were written in black ink, with red ink for use in headings and titles.

THE LOVELY OLD BOOKS ILLUMINED WITH PURE GOLD

Some were written in gold and silver. The British Museum possesses a copy of the Gospels written entirely in gold.

Vellum was very costly, and in many cases sheets were cleaned of their original matter and used again. Manuscripts written on second-hand vellum are called palimpsests, and are of the greatest value to archaeologists, as the ghost of the original characters lies under the new, and by restoring the first writing texts of great value have been recovered underneath.

When paper was introduced for literary purposes in the thirteenth century, the character of the writing and illumination changed with the rougher surface of the new medium. The invention of the printing press was naturally the beginning of the decline of both writing and illumination, except for specific purposes. A very beautiful and spiritual art has thus been almost lost to the world.

The real meaning of illuminated manuscripts is a book "lighted up" with gold and clear, radiant colours. The earliest Gospels and Prayer Books are in this form. Lovely colours run riot in their pages; the earliest reflect the spirit of classic art, but for the most part their ideal of ornament was Byzantine, the style of illumination which reached its highest point in the ninth century and for two hundred years was a strong influence. Its decadence, in the thirteenth century, is marked by the same stilted artificiality that stamped the later church mosaics.

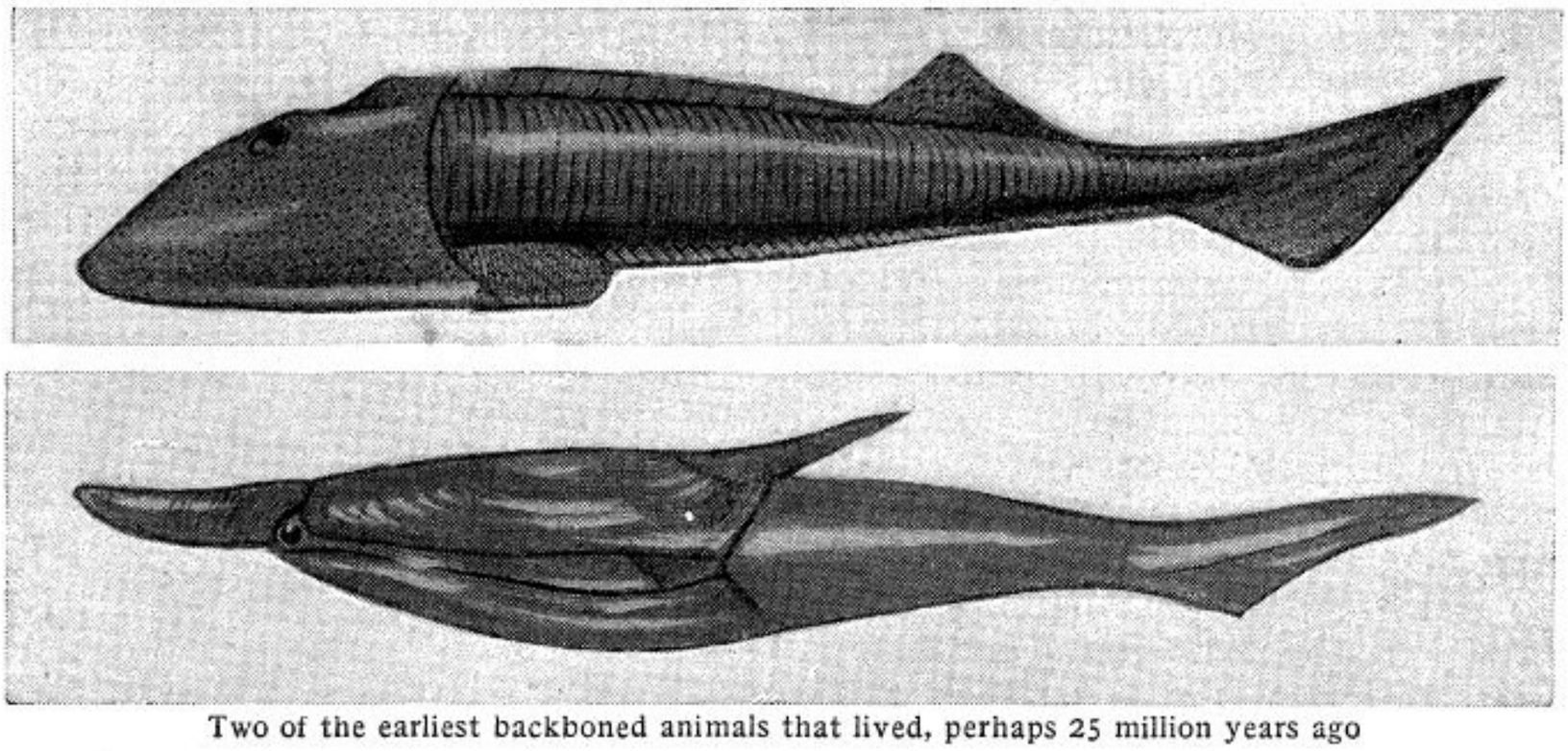
THE FAITHFUL MEN WHO SPENT THEIR LIVES IN MAKING LOVELY BOOKS

The decorations of these illuminated manuscripts took the form of full-page pictures, vignettes and miniatures, marginal designs, and very lovely initials. The initials of the finest vellum books are truly a great joy. They fling out their dainty designs to any part of the page; some of them hold a picture within the compass of the letter.

The monasteries were largely the source of illuminated manuscripts, and as monasteries spread over Europe the art of vellum painting was taken up in England, Ireland, France, Germany, and Flanders. Numberless copies of the Gospels, Books of Hours, missals, hymnals, and the lives of the saints were produced. They were made for members of the wealthy class and for the inmates of the abbeys and monasteries themselves. There is a wonderful collection of illuminated manuscripts in the Grenville Library of the British Museum. There we can see displayed the strangely lovely design in which little birds and animals and vine tendrils get so delightfully mixed up, and strands of ornament are flung about the text as if they had been living things and the wind had entangled them.

THE MARVELLOUS BOOK OF KELLS MADE BY IRISH MONKS 1000 YEARS AGO

One of the most beautiful things in the world is an illuminated manuscript by the monks of the Irish monasteries. It is a copy of the Gospels known as the Book of Kells, written and illumined about the eighth century, and now treasured in the library of Trinity College, Dublin. The Irish monks, unlike Byzantine scribes, did not use gold; their ornament is both dainty and rich at the same time. When we see a page of text of the Book of Kells containing an initial or a marginal design we feel that, with all our art and improvements and reproduction of pictures everywhere, we are but poor and outcast, and our own illustrated books seem hardly entitled to exist beside these shining glories of the Long Ago.



Two of the earliest backboned animals that lived, perhaps 25 million years ago

LIFE MAKES THE BODY

We read here of the way in which life became clothed—that is, of the making of the body. The first animals were never able to do much in the world, for two reasons. They lived in the sea and could not get enough oxygen, and they had no backbone, and no animal without a backbone has ever been of much importance in the world.

If we could summon before us all the animals that exist, and look at them carefully, we should be able, in spite of all their differences, to divide them up into two great classes, so that all the animals in one class would be far more like each other than they would be like any animal in the other class. In the one class we should place all the animals that have a backbone, and in the other all the animals that have not.

It is true that we should find a few animals about which we could not be sure, or which we should have to place between the two classes, for there are a few kinds of animals still living which have only half a backbone, or something that looks like a rough model of a backbone. These animals are immensely interesting, because they teach us how the backbone began.

Let us begin first with what are much the least important class of animals—those which have no backbone. We deal with them first because they actually came first. For ages there were animals of many kinds living in the sea, and others living on land, which had no backbones; and if you had searched the whole Earth and all the seas you would not have found a backbone anywhere—or a brain.

These animals which have no backbones are very difficult to arrange in any kind of order. Some are more wonderfully made than others, and have not existed so long. But they differ from each other so widely that it is really impossible to arrange them in a simple order. In any case, however, these backboneless animals, such as insects, oysters, and worms, are very humble and unimportant.

None of them has a brain. This does not mean that they cannot feel, nor that some of them, such as the bees, are not wonderful in many ways; but, after all, until the brain came into existence no great progress could be made. So we need here say no more about the backboneless animals.

Nor need we here say anything about the curious kinds of animals which show us the first hints of a backbone. We may begin with those animals in which the first complete backbone—though a very simple one—is to be found. They are the fishes.

If we study all the kinds of backboned animals, we find they can all be arranged in a simple way. More than this, it is possible to show which class came first, which last, and so on.

Here, then, are the five great classes of the backboned animals—fishes, amphibia, reptiles, birds, mammals. Some of these words are strange, but they are really not difficult, and we shall easily explain them. For instance, if you have not heard of amphibia before, at any rate you know a frog when you see it, and if you have never heard of mammals, it is easy to remember that mammals are animals which feed their young by means of milk, as, for instance, a cow, which feeds her calf. A human mother feeds her baby in the same way.

THE HISTORY OF THE ANIMALS THAT HAVE BACKBONES

There are very great differences between a fish, a cow, a sparrow, and a frog ; yet they all agree entirely in the main lines on which their bodies are made, because they all have a backbone. And we shall see soon that they agree in many other things besides. It is true that the fish is cold-blooded, and breathes water (or rather, the air dissolved in water), while a cow or a sparrow is warm-blooded, and breathes air, but so far as the great history of the body is concerned, all these backboned animals are far more like one another than like any animal that has no backbone.

Now we want to trace upwards, if we can, the history of these various kinds of backboned animals. The first, we are certain, were the fishes. The backbones of the fishes are the principal part of what we call their skeleton ; and this skeleton, inside their body, is covered with soft parts like muscle and skin. This fact, the possession of a skeleton inside the body, built up around the backbone, is true of all backboned animals.

But on no account must we confuse the fishes with animals like the whale, which is a newcomer compared with the fish ; and we must here give up, once and for all, the utterly wrong notion that all the animals found in the sea are fishes. Some of these animals have existed ages and ages longer in the sea than any fish. They have no backbones, no hints of a brain, and are as inferior to the fish as the fish is to a cow. We have no more right to call crabs fishes because they live in the water than we have to call a worm a bird because it breathes in the air.

Backboned animals very often have limbs—fore legs and hind legs, or arms and legs, or wings and legs—and the making of these limbs is one of the most important facts in the history of the body.

THE MAKING OF THE BODY—THE FISH THAT GROWS INTO A LAND ANIMAL

The nearest approach to anything like limbs in fishes is in their fins. We believe that certain fishes which had a long fin stretched right along each side of the body, from head to tail, played a great part in the making of the bodies of higher and later animals, for from these long side fins there were gradually formed, as the ages went on, two pairs of limbs, one pair in front and one behind, which are found after this time in all backboned animals.

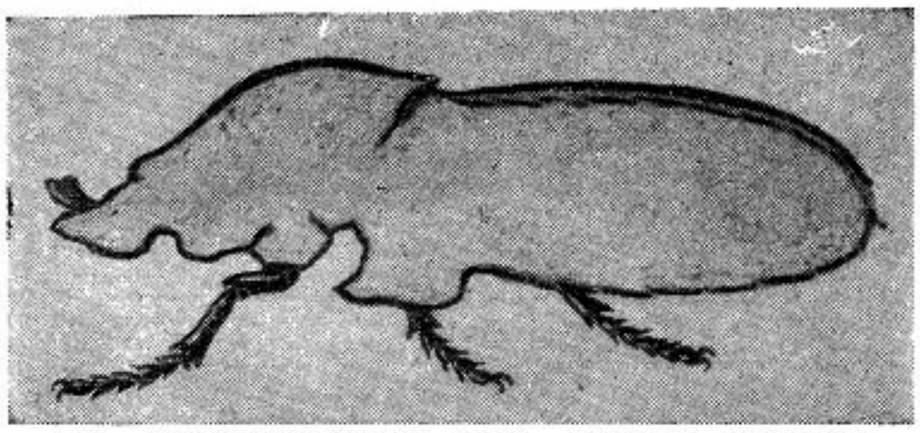
Now, we remember the great step taken by life when first it swam ashore. We know even now certain fishes which can get along for some time in the air, and they give us a little hint of what happened, especially as some of these fishes are very clever at hopping along in the mud. If now we turn to the next class of backboned animals, which have that difficult name amphibia, we shall be able to guess what happened.

Amphibia is really a Greek word, and means " both-life." It is a word made up to say that animals of this kind, such as the frog, lead both kinds of lives—in water and on land ; each amphibian begins by leading the one kind of life and goes on by leading the other, and this gives us a hint—the history of life in the great chain of backboned animals.

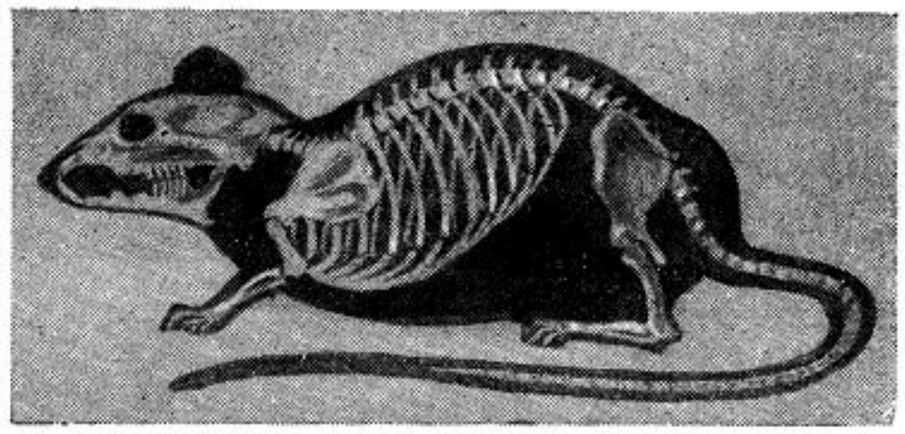
THE ANCESTORS OF THE FROGS LAID THE PLAN FOR BACKBONED ANIMALS

When the frog is very young, it is called a tadpole. This lives in water and breathes water. If it never went any farther, we should properly call it a fish. So long as it is a tadpole it is a fish ; but, of course, if it were no more than a fish it would live in water all its days. The tadpole does not do this, but after a time it begins to make great changes in itself ; there begin to be hints of limbs and, what is even more important, of lungs ; and at last the little tadpole grows into a frog, which is not a fish, which has arms and legs, or fore limbs and hind limbs, and breathes air by means of lungs. But this is not the only development ; for the frog has hands

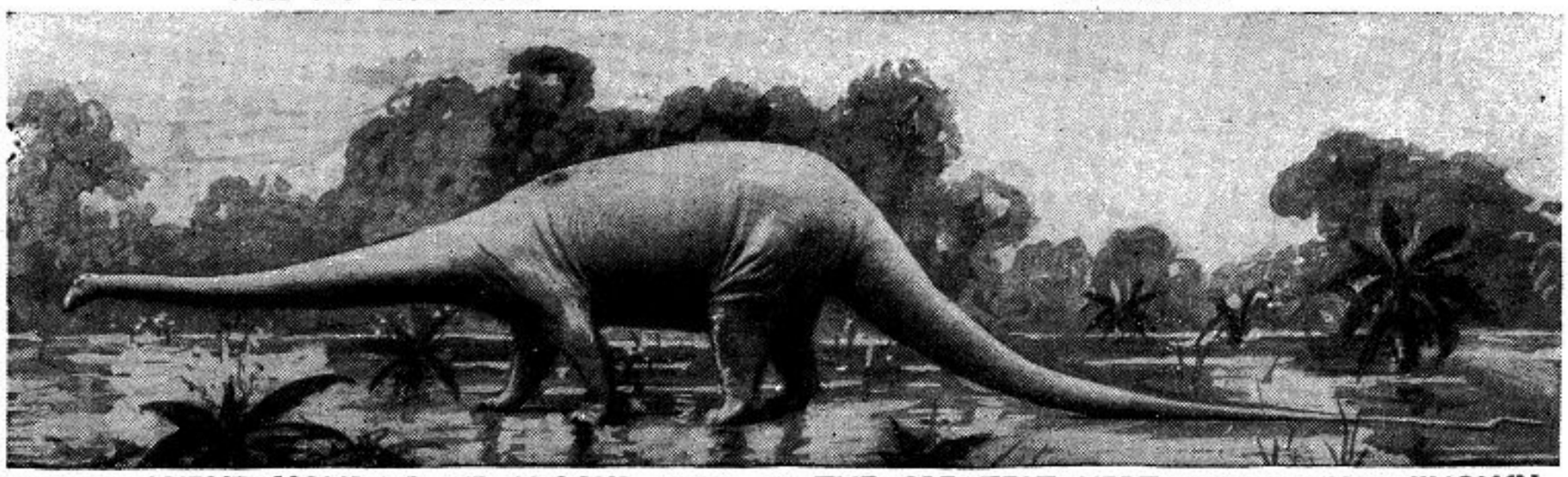
THE BACKBONE—NATURE'S STAMP OF MERIT



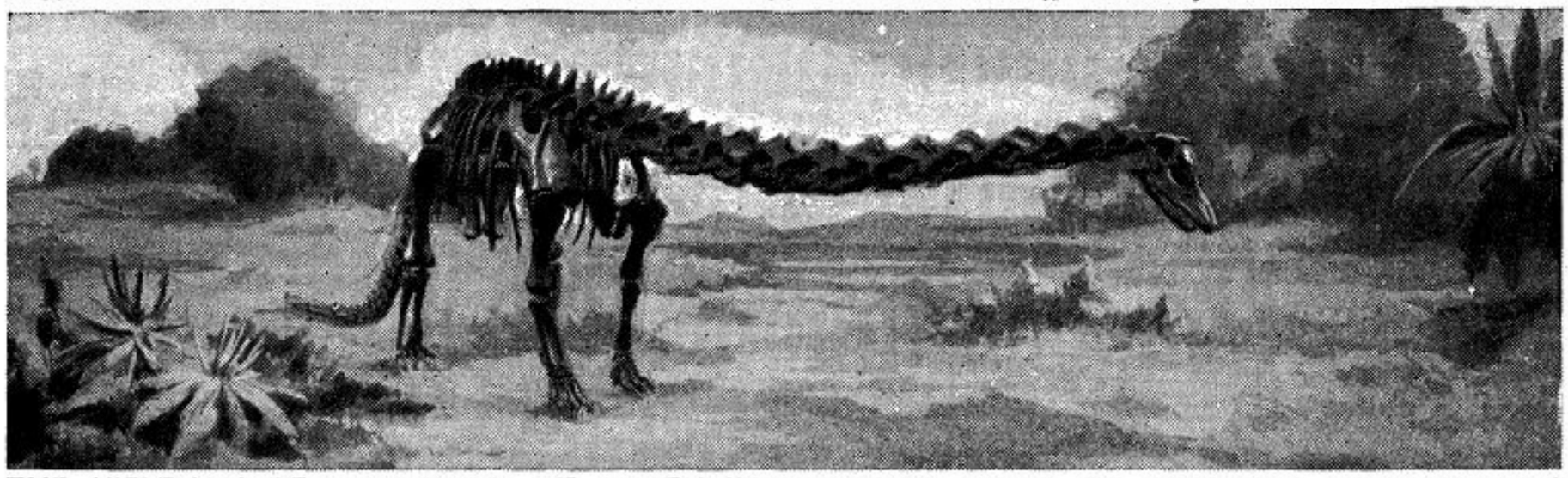
AN INVERTEBRATE—THE BEETLE, WHICH HAS NO BACKBONE



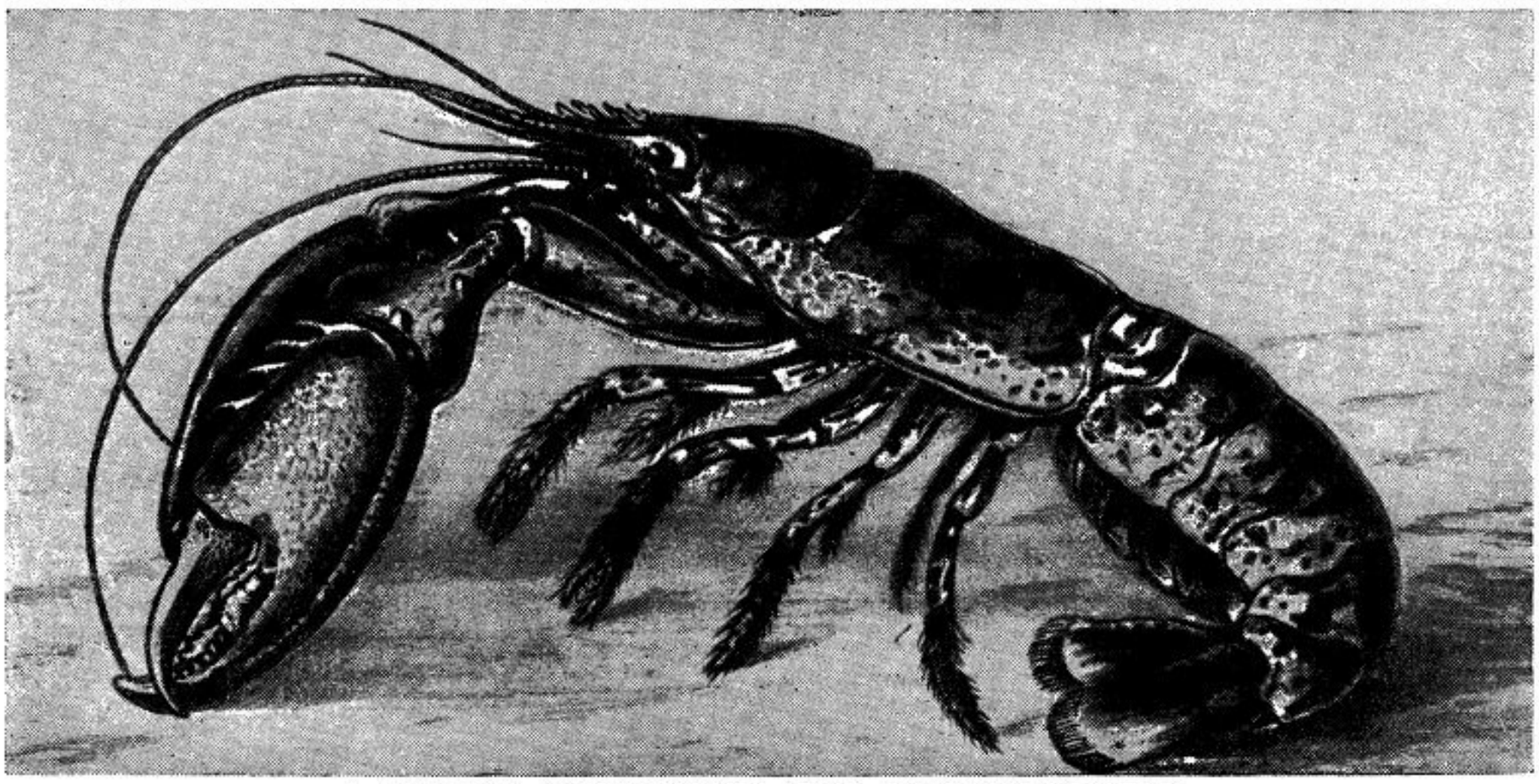
A VERTEBRATE—THE MOUSE, WHICH HAS A BACKBONE



THE ANCIENT MONSTER DIPLODOCUS. ONE OF THE GREATEST VERTEBRATES EVER KNOWN



THE SKELETON OF DIPLODOCUS AT SOUTH KENSINGTON, WITH ITS BACKBONE 80 FEET LONG



A FAMILIAR INVERTEBRATE—THE COMMON LOBSTER

The backbone is Nature's stamp of merit. The backboned creatures we call Vertebrates ; those without backbones are Invertebrates. The backbone may be long, as in old Diplodocus, or short, as in a mouse ; but it always means a highly-developed nervous system. The animals without backbones, like the lobster, may have splendid outside armour, but they always belong to a much inferior type of Life.

as we have, each having four fingers and a thumb, while it has five toes on each of its feet. Ages and ages ago, the first frogs laid down the plan of the kind of limbs which all backboned animals since then have had; though some of them, like the bird, do not keep this kind of five-fingered limb all their lives.

Now, when the frog is grown from the tadpole into a backboned animal with four limbs, breathing air by means of lungs, it is really very like certain of the next class of backboned animals, which are called reptiles. It is not like a snake, but it is like a little lizard—especially if the lizard has no tail. Indeed, the simplest way of looking at this is to think of the amphibia as fishes when they are young and reptiles when they are grown up. The young frog or tadpole is practically a fish, because it is made as a fish is made, and does what a fish does. The grown-up frog is practically a reptile, because it is made as reptiles are made, and does what they do.

WHEN THE REPTILES WERE THE MASTERS OF THE EARTH

Now we leave the amphibia and may pass on to the next class of backboned animals that appeared upon the Earth, which were the reptiles, and of these we need not say much, except that many of the reptiles gradually lost their limbs and have become very long and round and crawling, until at last they took the shape of snakes and serpents. Snakes and serpents in their very earliest stages show that they are the children of creatures that had limbs, and we are certain of this. A snake has no limbs that we can see; it has lost them and has taken to moving about in a different way.

Now we are getting much higher, and coming to times nearer to our own. There was a stage in the story of life when the reptiles were masters. There was then nothing to beat them. They grew to great sizes, and if you go to museums you may see the remains of their bodies, sometimes sixty feet long. Some of them, especially the smaller ones, grew great stretches of skin between their outspread fingers, a sort of web such as we find in the feet of many swimming birds, and so they were able to fly more or less. Some of them were perhaps very fierce and powerful, and they had terrible teeth. It must have been a very strange Earth in the age of reptiles.

Then, somehow, a wonderful thing happened. This was guessed at long ago, but it was proved only last century by the discovery of the remains of certain curious animals which do not now live on the Earth at all.

HOW THE BIRDS FIRST CAME INTO THE WORLD

If you think of a snake, and then of a lark, you would never guess that the birds have sprung from reptiles; but if, instead, we take a reptile, such as a small lizard, which has not lost its limbs, and then look at the remains of certain creatures which once existed, we discover that birds have sprung from reptiles.

Of course, there are a great number of very marked differences between reptiles and birds, both in their appearance and in their ways of life. No bird now living has teeth, for instance; birds have feathers, and so on. Yet we discover the remains of birds which once had teeth, and we know that birds have sprung from the reptiles.

Lovers of birds are almost inclined sometimes to place them on a level with the mammals themselves, and it is true that in some ways the birds are equal to the mammals, and in some ways even superior to them. But really no one, not even the best lover of birds, questions that the highest group of animals, and indeed of living things of any kind, are the mammals. Where did they come from?

It seems most likely that the mammals did not spring, like the birds, from the reptiles, and it is quite certain that birds did not spring from mammals or mammals from birds. We must go right back, not so far as the fishes, but at any rate as far as the amphibia, to find where the mammals have sprung from.

THE GREAT UPWARD CLIMB OF THE ANIMAL WORLD

The picture on page 79 shows us how from the fishes there sprang the amphibia; how from some of the amphibia there sprang the reptiles and birds; and how from other amphibia sprang the mammals. A few of the earliest mammals must have led a hard life on the Earth, even during the age of reptiles.

They cannot have had anything like the strength of the reptiles, yet they survived and flourished—partly by keeping out of the reptiles' way, and by going to corners where the reptiles did not want to live, but more especially because of the

great care they gave to their young—a care far better and finer than anything to be found in the rest of the world of life. And so they went on from strength to strength, until now man, the highest of the animals, is the master of the Earth.

Now, throughout all these long ages, while so many changes have been happening, and so many different kinds of animals have come into being, nothing has ever happened to cause the disappearance of the backbone.

THE CHIEF FACTOR IN THE MAKING OF OUR BODIES

On the contrary, it has steadily become more and more perfect. You know what the backbone of a herring is like; it is a very useful thing, without which no herring or other fish could grow; but it is very simple, and only fit for a creature which leads a very simple life, and from its birth to its death it makes practically only one kind of movement.

As we pass upward we find—in the frog, for instance—that the backbone is becoming at the same time stronger and less simple, and as we pass up higher still we find this process going on until, in a mammal, the backbone is so complicated that we might spend a lifetime in studying it.

In ourselves, as in the fish, it is the chief factor in the making of our bodies. It is something like the keel of a ship, upon which everything else is built; but it is, at its simplest and smallest and weakest, a million times more wonderful than the keel of the biggest ship ever made.

THE BUILDING UP OF THE BACKBONE OF THE BODY

We know that the backbone is not really one bone, but is made up of a number of little bones laid in a line. Indeed, these bones are built or placed on one another, just as we may place a number of stones on one another in building. For this reason the backbone (or spine, as it is often called) is as often called the spinal column. The little bones of which it is made have the not really very difficult name of vertebrae, a single one being called a vertebra; and the scientific name for animals that have a backbone is Vertebrates, while those which have none are called Invertebrates.

All backboned animals above the fishes either have two pairs of limbs all their lives; or have them at the very beginning and lose them afterwards, like the snakes; or have them when they are grown up, but not at first, like the frog. No backboned animal ever has more than two pairs of limbs.

The serpent loses its limbs, the whale turns its fore limbs into flippers, and in order to find its hind limbs, or legs, which have fallen out of use altogether, you have to dig deep in its blubber, or fat. But there you will find them all the same —toes and all. The birds have learnt to turn their fore limbs into wings. When the chick is very young, it has five fingers on each hand, like its forefathers, but later it finds that these are more than it needs to build a wing upon, and when it is grown up we find that the wing is really only built upon three and a half fingers. The other one and a half have disappeared, as they were not wanted.

The use of limbs is for movement; but if we trace limbs upwards from the days of the frog, or at any rate from the days of the earliest mammals, we find that the fore limbs begin to be used not only for movement, but also for other purposes. For instance, we know for what terrible purposes the tiger uses his claws.

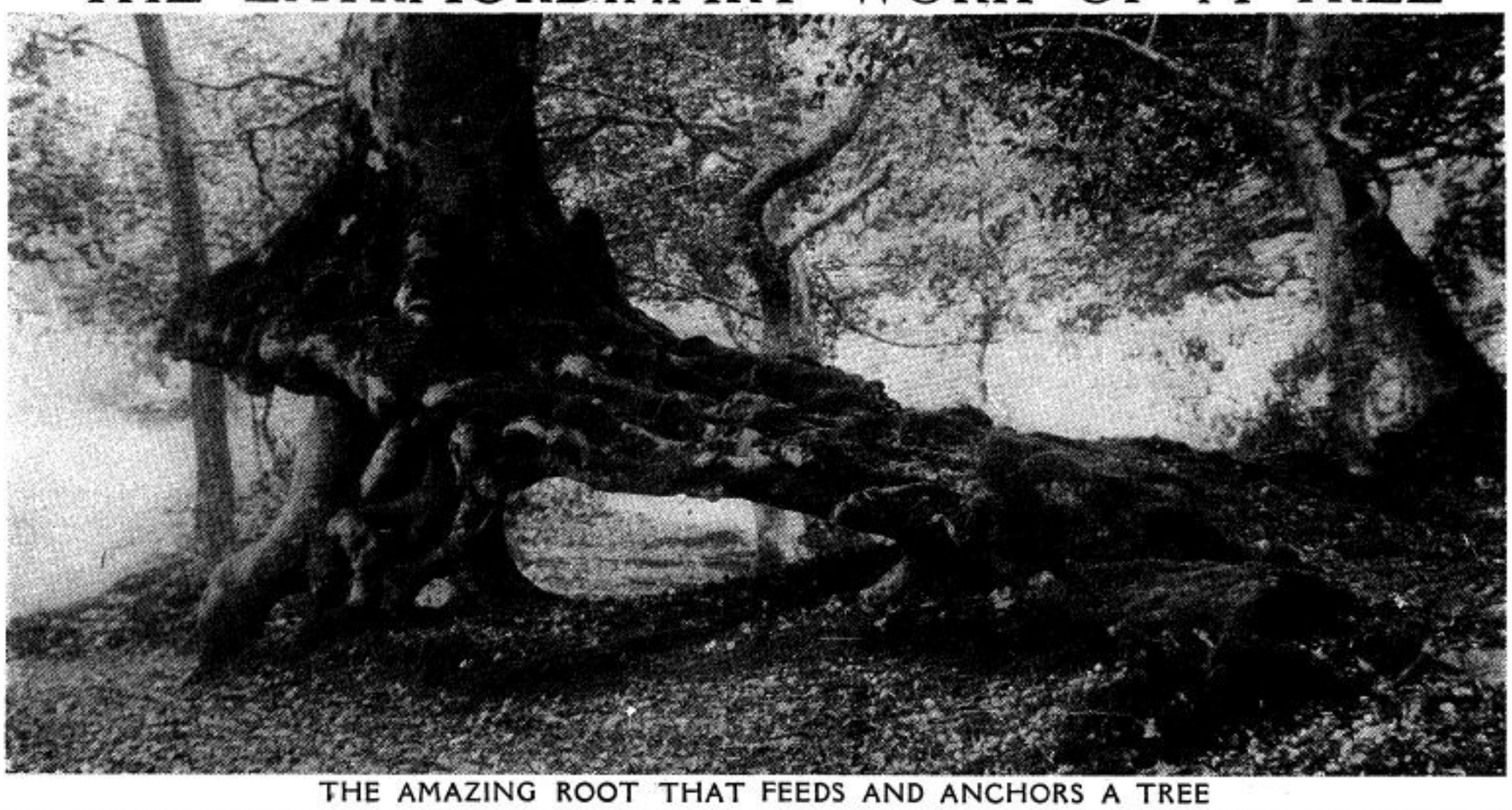
HOW IMPORTANT IS THE FREEDOM OF MAN'S ARMS

If we go to a higher mammal than the tiger—as, for instance, to the monkey—we find that he does much more with his fore limbs. The cleverest lion or tiger, though it will steady its food with its claws while gnawing at it, cannot pick up its food in the way that we can and take it to its mouth. The monkey does this; it has learnt the art of grasping.

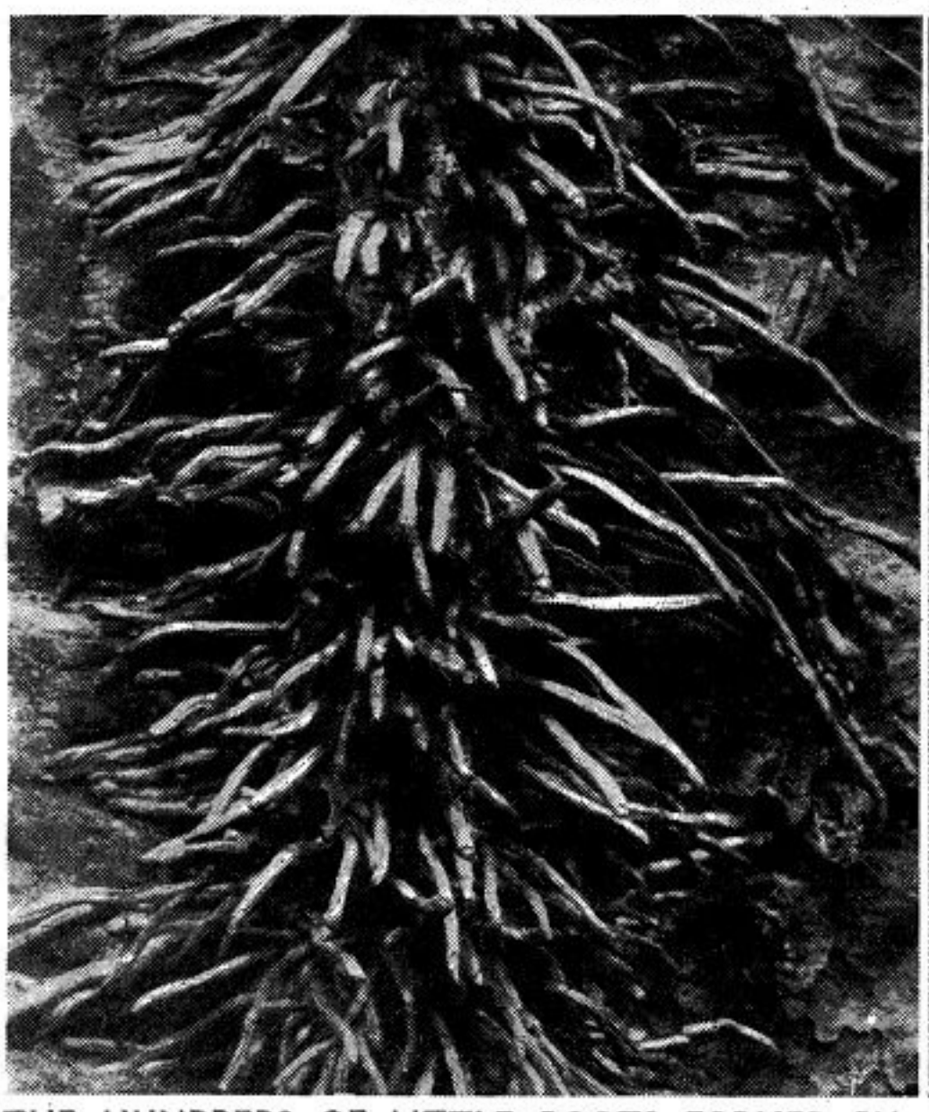
In man the spinal column has been made into a real column because he stands upright; only babies now use their fore limbs for walking. Once the crawling stage is passed, our arms are freed for ever from purposes of walking, and are used instead as the great servants of the brain, without which man could have done nothing in the world, and, indeed, would have been starved and hunted out of the world by animals long ago.

It is almost impossible to say how important is the freedom of man's arms, or fore limbs, from the mere purpose for which he now uses his feet, and for which the hands of all other backboned animals have been used for so many ages. But the hands of men, as we said, are the servants of the brain and the nerves.

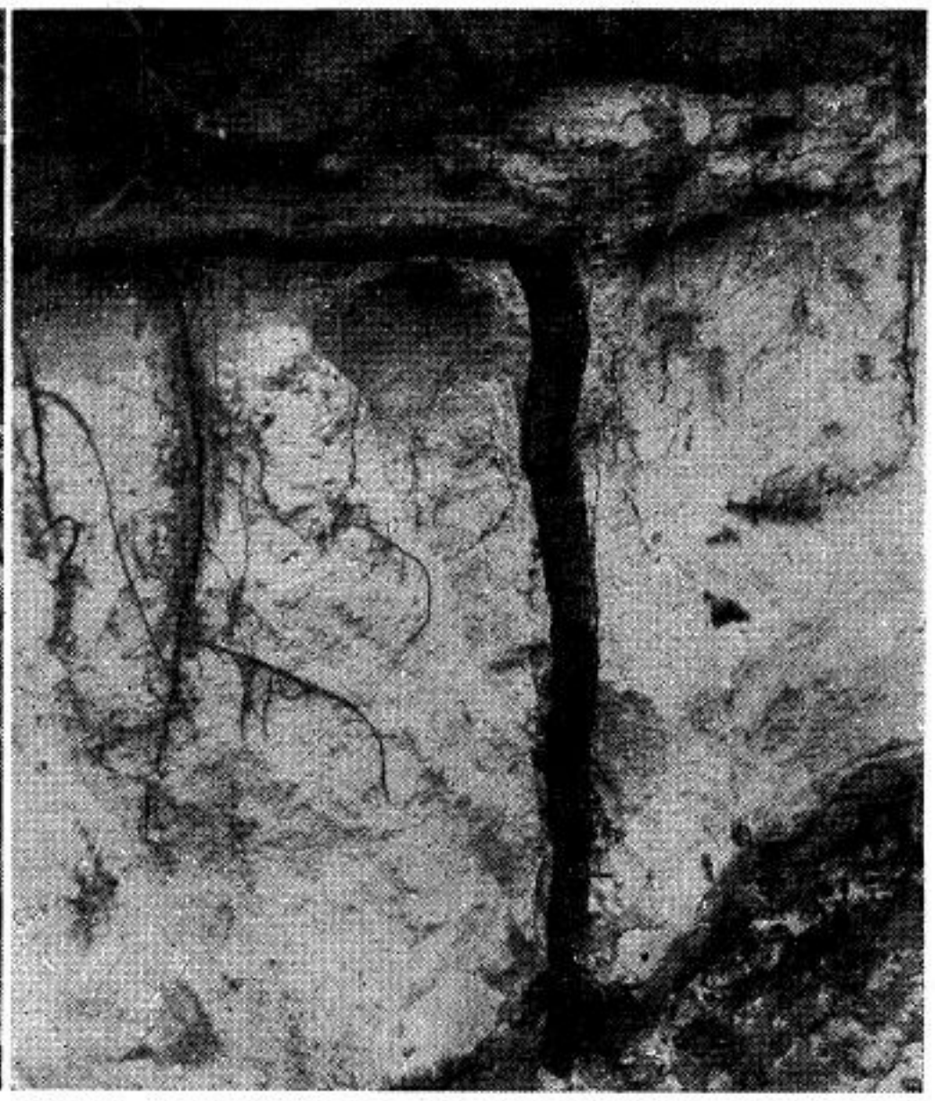
THE EXTRAORDINARY WORK OF A TREE



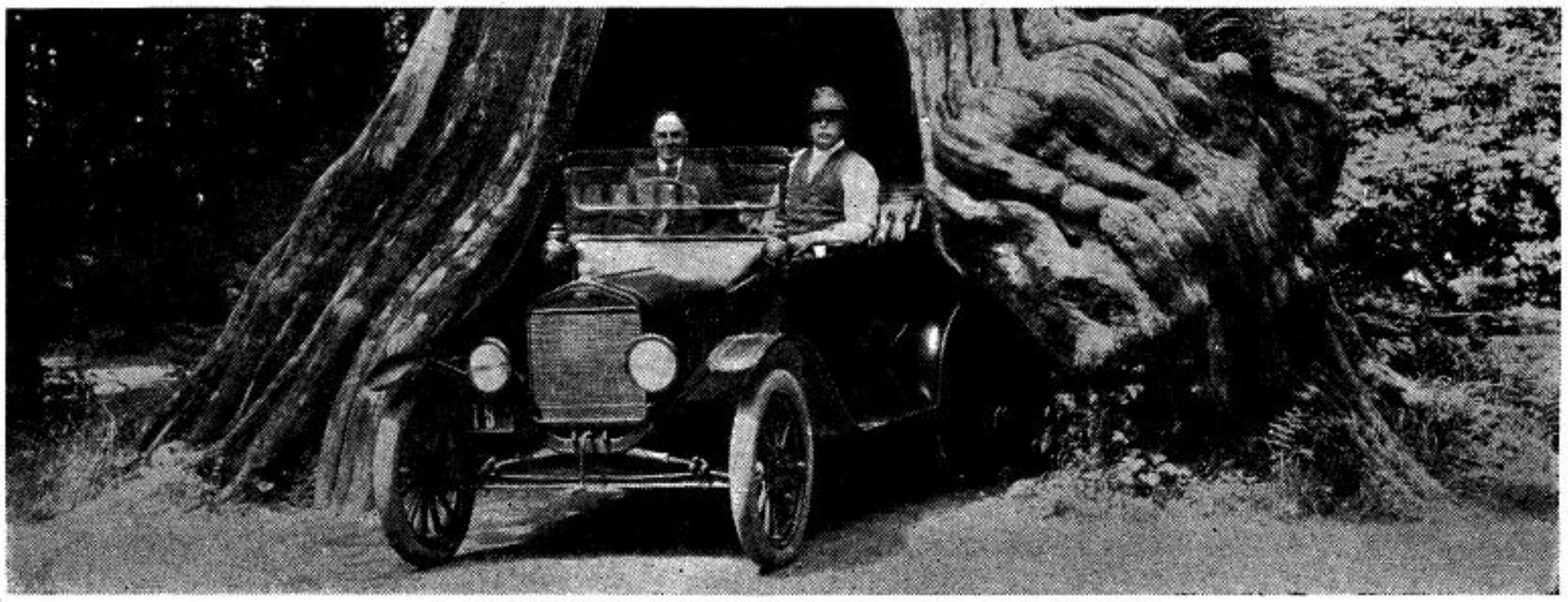
THE AMAZING ROOT THAT FEEDS AND ANCHORS A TREE



THE HUNDREDS OF LITTLE ROOTS FORMED BY THE IVY FOR CLIMBING AND CLINGING

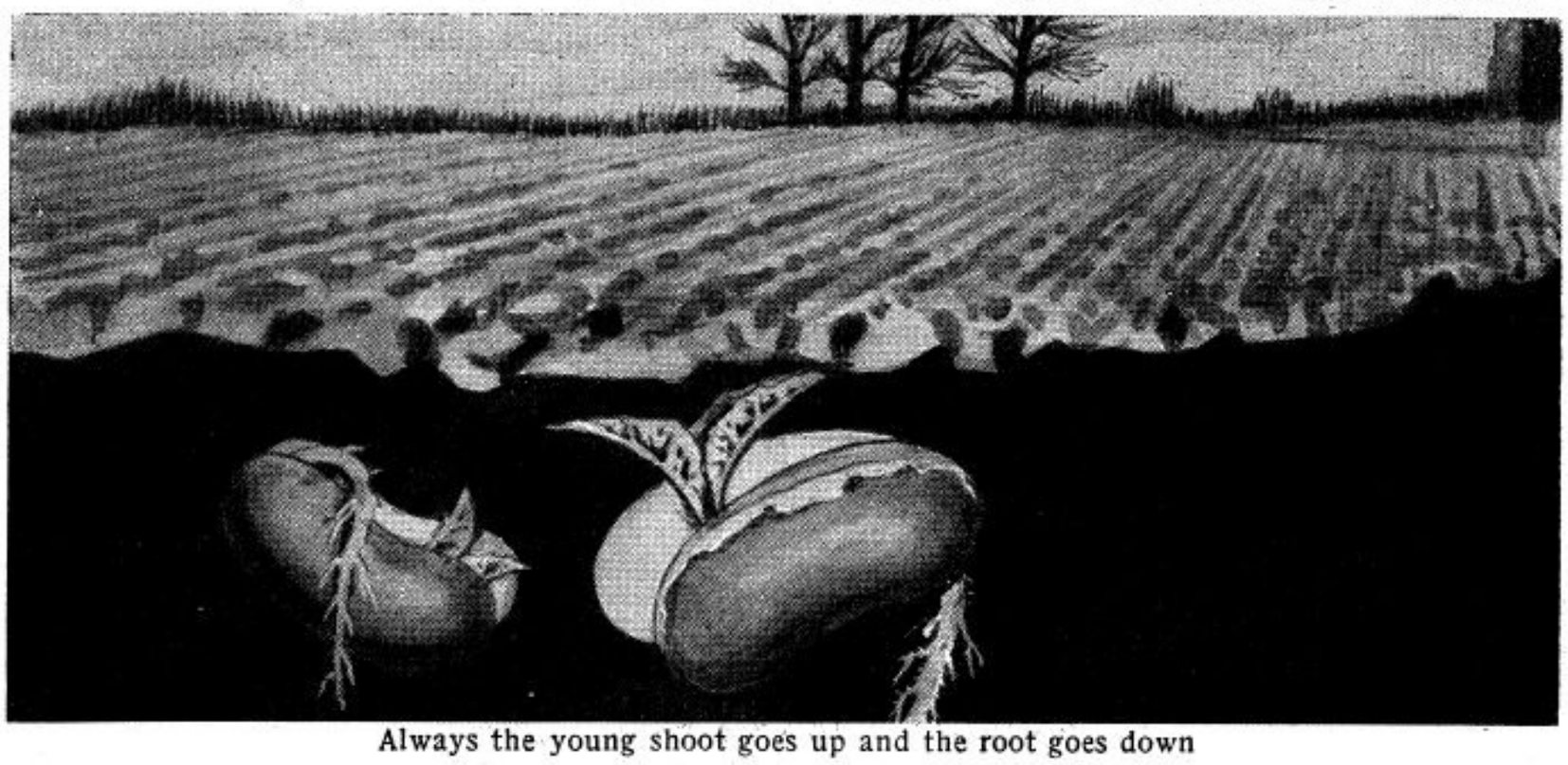


HOW A ROOT WILL TURN SHARPLY ROUND IN SEARCH OF FOOD



A MOTOR-CAR INSIDE THE TRUNK OF A TREE

The Story of the Marvellous Plants that Cover the Earth



Always the young shoot goes up and the root goes down

HOW PLANTS WORK FOR THEIR LIVING

BECAUSE plants spend but little energy in the form of movement, we are apt to under-rate their working powers.

Only some of the simplest plants, swimming about in the water, show any sign of locomotion, but the majority are very busy. As among animals, the business is mainly two-fold—caring for self and caring for others. It is the first of these that we have to do with here, and it means capturing raw materials, manufacturing these into carbon compounds—sugar and starch, fat and oil, and, above all, *proteins* (like the gluten of wheat); and using this self-made food for upkeep, for growth, and for storage.

A great part of the work of green plants is devoted to increasing the amount of living matter; to growing, in fact; and we cannot look at an oak-tree a hundred feet high without feeling that to build this up from an acorn the plant must have done an immense amount of work. Some of the Big Trees of California (the Sequoias) are about 300 feet high, and this is near the limit, for there is a limit beyond which a tree cannot grow without tumbling down, and we sometimes see healthy trees laid prostrate because, when a strong wind came, their foundations would not stand the strain. Some of the great seaweeds, such as oar-weed, grow to a very great length without having any hard tissues for support, but in these cases the heavy plant is floating in the water.

The most ancient plants lived probably in shallow water near shore, and when we look at the great beds of seaweeds exposed at low tide, we get some idea of the primeval vegetation—after ages and ages of the simple free-swimmers. The first use of the root was to anchor the plant so that it could not be swept away into deep and dark water, and that is the use of the so-called roots of seaweeds today.

But land vegetation, when it began, meant among other things the need for a new water-absorbing organ, and this is the main use of the root. A seaweed absorbs the water by the general surface of its fronds, and similarly the beautiful bladder-wort of bog pools, having no roots, must absorb water by its leaves. This is not possible in ordinary land plants, and thus the chief use of the root is to absorb water and salts from the soil. Of course, when the stem of the plant rises high, as in trees, the roots serve as foundations, or anchors; and another use of roots is to form a storehouse for reserve food supplies. This is plainly seen in the case of edible roots like carrots.

The tip of a root is clear and delicate. It remains ever-young and growing ; it is always feeling its way farther into the soil. Its growing-point is protected by a root-cap which saves the delicate, rapidly-dividing cells from being punctured by sharp particles in the soil. A little way behind the growing part we see the origin of numerous root-hairs which are of fundamental importance to the plant. They are the water-absorbers.

There are often many hundreds of root-hairs to a square inch, and they grow like delicate fingers into the gaps among the soil-particles. They are outgrowths of the very living skin-cells of the root, and their use is to absorb the soil-water which occurs in delicate films round the minute particles. The wall of the finger-like processes that probe and bend in the gaps is very delicate, so that water passes readily through it into the denser cell-contents. Moreover, towards the tip of the root-hair the cell-wall is soft and gummy, so that a soil-particle may almost be said to be glued to it.

HOW THE ROOT-HAIRS WORK THEIR WAY INTO THE DARK SOIL

All that the plant gets out of the soil passes in by the delicate root-hairs, and no individual root-hair lasts very long. They shrivel away as the part of the root from which they arise gets older ; and new ones are formed nearer the tip. It is important to understand that the growing of the root deeper into the ground is always just at the tip, below the youngest root-hairs ; otherwise the growing would tear the root-hairs from their grip of the soil-particles, and of this there is no trace.

In the core of the young root there is a column of pipes or vessels (wood and bast), surrounded by a slightly corky sheath. There is another corky sheath just below the outermost cells that form the root-hairs. Between these two slightly corky sheaths there is the rind (or cortex) of the root, a sort of intermediate reservoir for the absorbed water. But as the root gets older the rind often becomes unimportant, or disappears altogether. What is most important is this—that the water captured by the root-hairs passes into the wood-elements of the root's core, and then into similar elements in the stem, until it finally reaches the leaves.

Before we leave the root it is of interest to notice two or three other points. Often as the root grows older it shortens as a whole, and this gives a plant a stronger hold in the ground. With the growth of the plant as a whole there is an increase in the total size of the root-work, and this is in great part due to the giving off new root-lets. It is very striking to find a boulder that has been cracked and has then allowed roots of plants to grow into it, with the result that it is eventually split in two. Then we may see the whole root-work of a heather plant, much larger than the bush above ground. Rootlets begin in the core of the root and their emergence is very striking, for a kind of digestion takes place in front of them as they penetrate the rind. They may be said to *eat* their way.

THE STRANGE WAYS IN WHICH THE ROOTS CLING AND HOLD UP WATER

Finally, there are roots that do strange things. Thus the little brownish air-roots of the ivy are used for climbing purposes, binding the stem tightly to tree or wall. In some of the perched plants of tropical forests, that live quite off the ground, the roots absorb water-vapour from the moist air. In the orchid which yields vanilla some of the roots serve as tendrils, and others dangle. They are able to absorb dew and rain, for they are surrounded by a sheath of large empty cells opening by pores to the outside, very much like the water-storing cells of the bog-moss.

In the bog-moss more than half the cells are dead and empty, but are kept from collapsing by delicate spiral and circular bands. Twenty times the plant's own weight of water may be stored in these cells, and this is used by the living elements which the others enclose.

THE BRICKS AND RAFTERS AND VENTILATORS OF THE LEAF

Thus, when there is prolonged drought the bog-moss is still able to flourish, and it is also in part to be thanked for holding-up the rain that falls on the hills, so that the springs are slow in becoming dry. The use of bog-moss for soaking up moisture from wounds is well-known. It is interesting to find the same sort of device in situations so different as the bog-moss and the vanilla roots.

Beyond any doubt, the green leaf is the most marvellous laboratory in the world. For there, in perfect silence, is brought about the raising of simplicity into com-

plexity, the making of the organic out of the inorganic. It is also the most important laboratory in the world, for all animal and human life practically depends on the nutritive material the green leaf builds up.

A leaf is a sheet of living tissue, sometimes as thin as tissue-paper, as in a young beech leaf; sometimes as thick as leather, as in a cabbage. Some leaves are so small that we can hardly see them with the naked eye, while some palm leaves are six feet long.

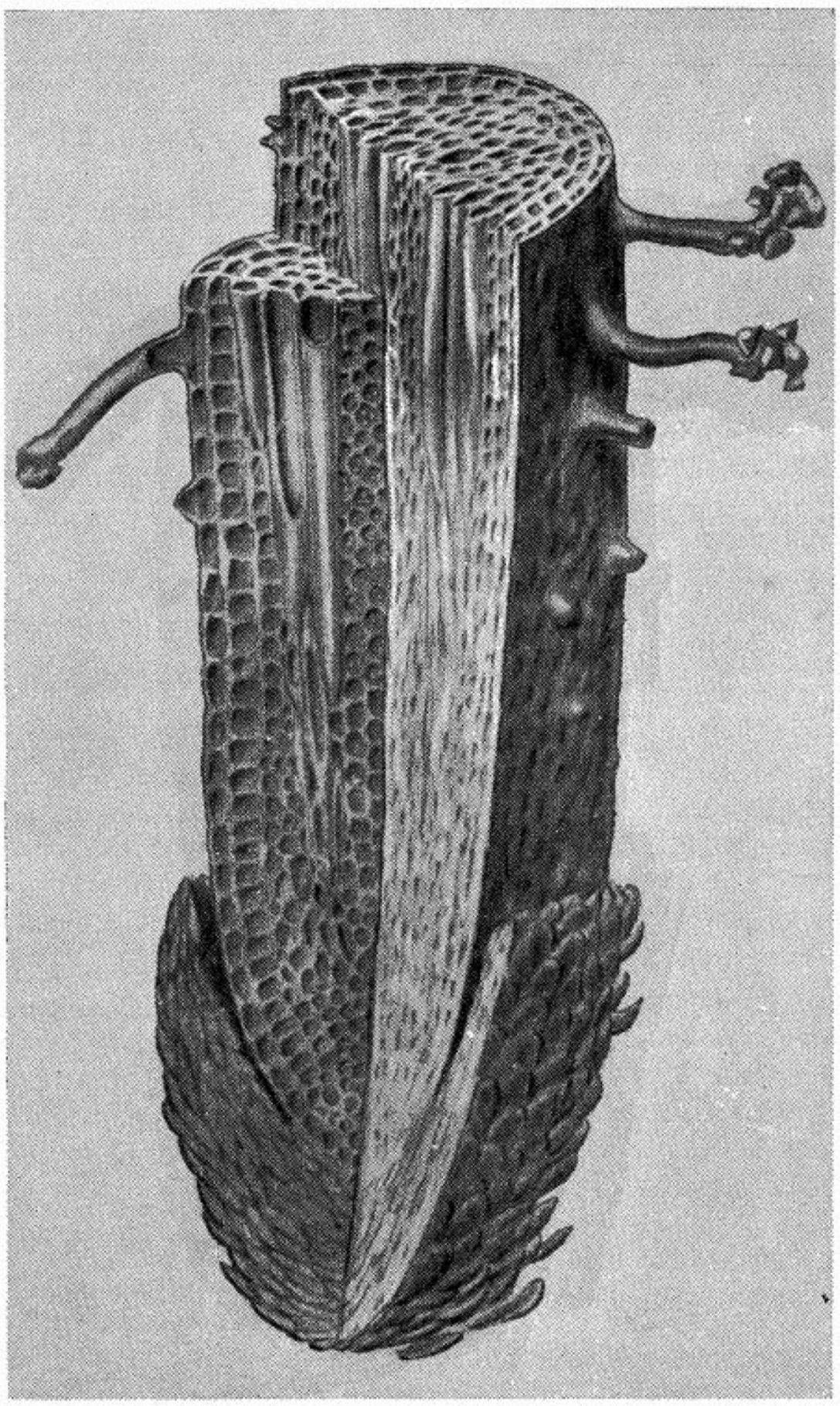
No self-supporting higher plant can get on without leaves unless an expanse of green is attained in some other way—notably by having a large area of green stem. Thus in cactuses the leaves are turned into spines, and the whole stem is green. What look like floating leaves in the case of the little duckweed on the surface of the pool—the smallest but one of all British flowering plants—seem to be tiny flattened shoots.

To understand the work of leaves we must know a little about the microscopic architecture. Think of a leaf hardly thicker than this paper, and even there is room for no small degree of structure. The upper surface is covered by a layer of skin-cells, and the outer walls of this are often thickened to protect the delicate, more intensely living units below. The skin-cells often bear non-conducting hairs, giving the leaf a woolly surface; or they may be, as it were, varnished with protective wax.

To the lower side of the leaf there is another skin (an epidermis), but every here and there on this surface there are pores called *stomata*, which allow of an exchange of gases between the leaf and the air. If the leaf is floating on the surface of a pond, as in the case of a water lily, there would be no use in having the openings on the lower surface which touches the water; and we are not surprised to find them on the dry upper surface.

Now between the two skins there is the middle green tissue of the leaf. Towards the upper surface the cells are arranged like bricks or posts, and often in two layers. They are called palisade cells. Towards the under surface there are more green cells, less closely fitted together, and the gaps between them communicate with the openings (or stomata). This is called the spongy tissue. The green colour of the palisade layers and the spongy layers is due to numerous green discs (chlorophyll corpuscles) lying in the living matter of the cells.

Finally, the leaf is supported by a framework or network of veins, which form the skeleton of the leaf. If we are not familiar



THE BUSY FACTORY IN THE ROOT OF A TREE

Here, in a highly magnified picture-diagram, we see the wonderful structure of a root, and the scene of a root's astonishing activities. The delicate growing point is protected by a hard cap. Immediately within the outer wall are the layers of cells which bring down food from the leaves, and next to them are the quill-like tubes which bring up food from the soil. In the heart of the root are the cells which store the starch from which the root nourishes itself and grows. At the top we see a few of the countless root-hairs which absorb salts and water from the soil.

with the appearance, we should collect some skeleton leaves, and, after washing them, hold them against the light to see the beautiful lace-work. The wood-elements of bundles that support the soft tissue of the leaf are also of use as conducting pipes by which the water and salts from the roots may be distributed to the green cells of the leaf, and by which the nutritive organic materials manufactured in the green tissue of the leaf may be carried downward, as "elaborated" sap, to the stem and the roots. It is useful to take a few leaves of the plantain from the side of the road, and break the stalk to see the four or five firm strands which are thus exposed. These are the conducting pipes up and down from root to leaf, and from leaf to stem or root.

THE GREAT CHEMICAL LABORATORY IN THE CELLS OF THE LEAF

The all-important fact is that the green cells in the middle tissue of the leaf, with thousands of chlorophyll discs turning their edges to the light, are able, with the help of the energy of the sunlight, to split up the carbon dioxide of the atmosphere, liberating the oxygen and fixing the carbon in the form of carbon compounds. This building up by the power of light is what is called *photo-synthesis*, but the essence of what takes place is not known.

The conditions for this photo-synthesis, which is the most characteristic work of green plants, are thus summed up by Professor F. O. Bower in his masterly book on The Botany of the Living Plant.

1. Chlorophyll must be present in the cells which carry on the building-up process.
2. Carbon dioxide must be accessible to them.
3. Light must reach them, and in sufficient intensity.
4. Temperature must be within certain limits.
5. Mineral salts must be available.

"These necessary conditions being met (says Professor Bower), the constructive process consists in the absorption of carbon dioxide, fixation of the carbon, release of free oxygen, and the appearance in the active cells of material formed from the carbon which has been fixed."

STARCH AND SUGAR MADE BY SUNLIGHT AND THE GREEN LEAF

The first visible product of the leaf's industry is starch, but this is preceded by the formation of formaldehyde and sugar. If a green leaf is covered with a plate of tinfoil or cardboard with the letters S-T-A-R-C-H cut out on it, and if the plant is kept in the dark for two days so that any starch already formed may pass down into the stem; and if the leaf is then exposed to sunlight for a morning, we can easily prove that the building-up process has been working only in the illumined parts.

For if the leaf be pulled off, boiled for a minute in water, then decolourised with alcohol and stained with iodine solution, the word Starch will be seen in purple letters on the exposed parts of the leaf, while the shaded parts will be yellow. The fact is that the starch is formed in the *illumined* chlorophyll discs.

If a shoot of Canadian water weed is fixed in a glass tube, with the cut end upward and exposed to light, bubbles of gas are seen escaping from the cut surface. It is easy to capture these and prove that they consist of oxygen. They are the result of the splitting-up of the carbon dioxide captured from the water, and by counting the bubbles and using glass of different colours it is not difficult to show that the red, orange, and yellow rays are much more important than those of the blue or violet.

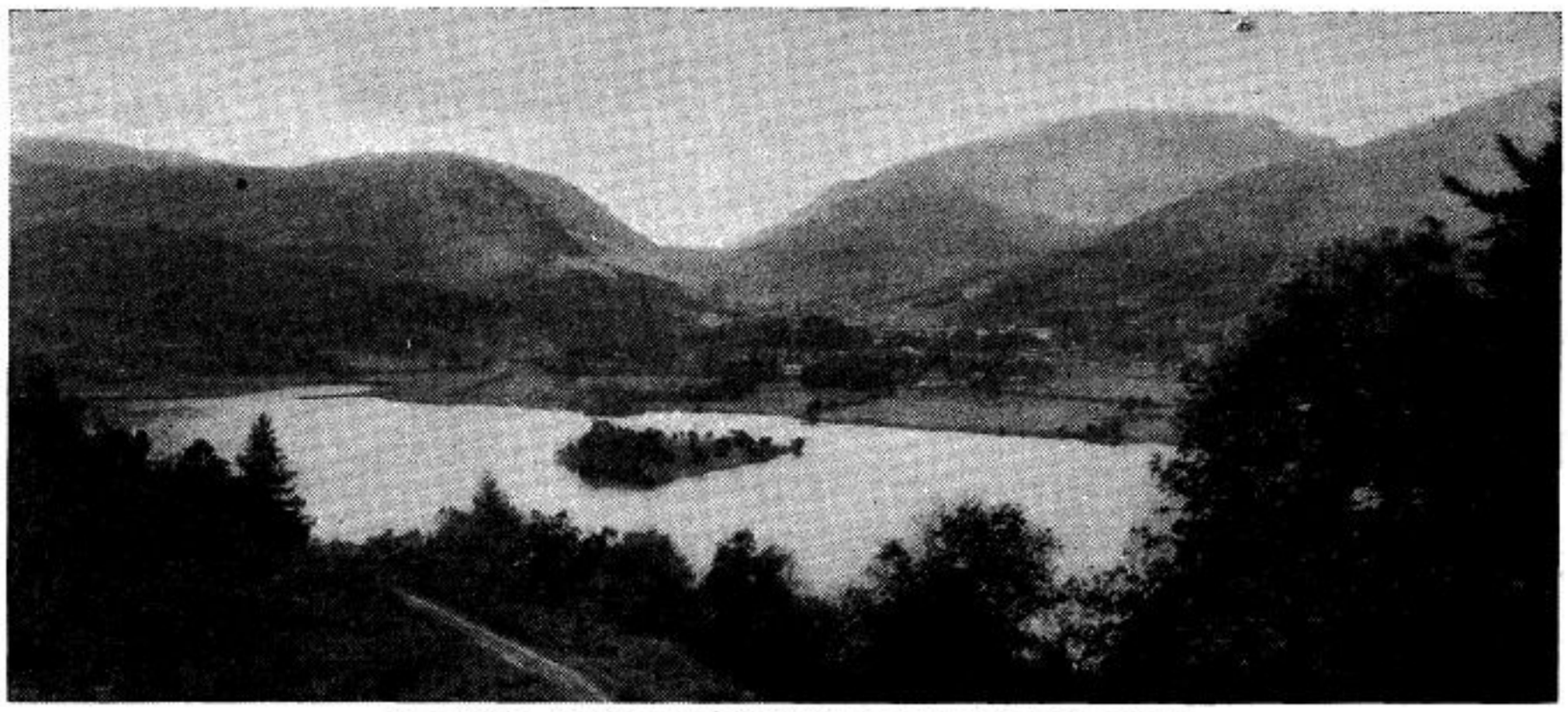
THE TINY MOUTHS OF THE LEAF AND HOW THEY BREATHE

Every living creature must take in oxygen and give off carbon dioxide, for living cannot go on without slow combustion (or oxidation). If we have in a room at night a lighted candle, a sleeping cat, and a green plant, all three are taking in oxygen, burning away carbon compounds, and giving off carbon dioxide.

It is at night that we must study the breathing or respiration of plants, for during the day the breathing process is quite disguised or masked by the feeding process. The little openings (stomata) on the under-side of the leaf are breathing-pores, and it is also by these important apertures that water-vapour is given off to the atmosphere. The stomata open and close in an automatic way, so that, though too much water is not given off, there is yet enough to keep the up-current from the roots steadily going on.

To sum up. Water with salts in solution is absorbed by the roots. It passes by the stem to the leaves, where it meets carbon dioxide which the leaves have absorbed. Starch and other materials are formed. They steal away by the bast of the bundles to the place where they can be used and stored. This is the daily work of a plant.

The Story of the Peoples of All Nations and Their Homelands



Mountains of the Lake District overlooking Grasmere

OUR GREAT AND LITTLE HILLS

ENGLAND'S little hills, with their graceful outlines and peaceful sheltering woods, are familiar presences to most of us, but there is nothing in them to abash our human conceit. Not so the mountains. Let us look at them first. Whether we see them bare in the sunlight, or wreathed in mists, or swept by stormy winds, they are profound and impressive in their solemn grandeur. Fully to realise this, however, we must match ourselves against their steepness and sternness and feel the influences of their upper solitudes.

If we trace the Cheviot range along the Northumberland Border to the south-west, and then southward to the Pennine Chain by the boundaries of Cumberland, Durham, Westmorland, and Yorkshire to its end in Derbyshire, we shall find more than 40 fells and moors and pikes and dodds of 2000 feet and more in height. If we add the Lake District peaks the number of mountains of 2000 feet and more in England is increased to over 200.

The Cheviot range culminates northward in The Cheviot, or the Great (Scottish Muckle) Cheviot (2676 ft). Several of the summits hereabout are over 2000 feet, by far the finest being the conical-peaked and rock-crowned Hedgehope, which, like the Big Cheviot itself, is in Northumberland. The massive height that gives its name to the whole range is quite a simple mountain, though with a steep slope. Its rocks are granite, but it is almost entirely a grassy sheep-walk.

From the top of the Muckle Cheviot there is a view over Northumberland that includes many miles of the coastline, from Berwick to Warkworth ; but the top is so flat that half a mile of boggy ground must be crossed before Scotland comes into view. There are 30 mountains in the Lake District higher than the Great Cheviot.

The Cheviots continue south-westward from their topmost height at an average elevation of about 2000 feet for half a dozen miles to Windygate Hill (2034 ft), and then sink to an average of 1600 feet as far as Peel Hill, where they almost reach the 2000 feet level again. Then they turn southward at lower levels down the boundary of Northumberland and Cumberland and become the Pennine Chain. Throughout they are a fine, grassy sheep-rearing range, cleft on either side by narrow glens, each with its infant stream flanked by hills that become more and more rounded as they sink away into Northumberland.

The most chain-like part of the Pennine Range is where, to westward of the Range, the River Eden clearly makes a valley between the Pennines and the mountains of the Lake District. The chain may be said to begin where the Newcastle to Carlisle railway breaks through. Northward of this gap the range is a continuation from the Cheviots, and it falls short of the mountain standard. Southward of the River Irthing there is a succession of mountains between the headwaters of the South Tyne, Wear, and Tees on the east and the Eden on the west, their western slopes descending sharply into the Eden Valley, while the range spreads more broadly into Northumberland, Durham, and eastern Westmorland.

This well-marked range continues for more than 30 miles, its central and highest mountain being Cross Fell (2930 ft), in the extreme east of Cumberland. The Shap Fells reach out eastward from the Lake District and link with the Pennines beyond the Eden at Appleby and beyond the Lune at Tebay. Along this Cross Fell Ridge are more than a dozen fells all rising above 2000 feet, some looking out across the Eden valley and some sending their waters down to the Tyne, Wear, and Tees. The next highest summits to Cross Fell, in this part of the range, are Milburn Forest (2780 ft), Mickle Fell (2596 ft) in Lune Forest, Hilton Fell (2446 ft), and Burnhope Seat (2452 ft).

INDUSTRIAL ENGLAND AND THE NORTHERN FELLS OF THE PENNINE RANGE

South of Kirkby Stephen, and around the sources and upper courses of the rivers Eden, Lune, Swale, and Ure, the Chain expands eastward and westward, and becomes a series of short ranges, mainly north to south in their trend. Here there are more than a dozen Fells rising from 2000 to 2300 feet, such as The Calf (2220 ft), north of Sedbergh, and Baugh Fell (2216 ft) to the east ; Wild Boar Fell (2323 ft) and Swarth (2235 ft) between the headwaters of the Lune and the Eden ; High Seat (2328 ft), Nine Standards Fell (2008 ft), Rogan's Seat (2204 ft), and Water Crag (2176 ft) around the early course of the Swale ; and Great Shunnor Fell (2346 ft) and Stags Fell (2213 ft) draining chiefly to the Ure.

These northern fells of the Pennine system are partly grazing grounds of rough grass and partly heathery moorland with broad and often boggy summits, with sides deeply cut here and there by narrow water courses, inhabited very thinly in their lower valleys, with rarely visited solitudes above. Their roads or tracks are several miles apart and rarely cross the summits. Some of them lead to lead-mines that began their workings centuries ago. The uplands act as gathering grounds for the chief rivers of the North, and as they spread more broadly at lower levels, with wider valleys and lower heights, and reach the coal-bearing regions, they become on either side the great manufacturing areas of Northumberland and Durham, western Yorkshire and eastern Lancashire, north Derbyshire and eastern Staffordshire. Modern industrial England has been largely based upon the fringes of the Pennines where coal has been found.

A BREAK WHICH LEADS US INTO THE FLAT PLAIN OF YORK

West to east Wensleydale makes a break in the hills right into the flat agricultural plain of York. The Pennines continue south of the gap, the rivers Lune and Ribble making their way down the western watershed of the Chain to the Irish Sea, and the tributaries of the Yorkshire Ouse—the Nidd, the Wharfe, the Aire, the Calder, and the Don—reaching the North Sea after making various confluences. South of Wensleydale the 2000-feet Pennine heights are more scattered. On the western flank, between the Lune and the Ribble, are Whernside (2414 ft), Gragreth (2250 ft), and Ingleborough (2373 ft) ; between Ribblehead and Wensleydale Dodd Fell (2189 ft) and Weather Fell (2015 ft) ; between the upper Ribble and the upper Wharfe Penyghent (2273 ft) and Fountains Fell (2191 ft) ; between Wharfedale and Nidderdale Buckden Pike and Great Whernside (2310 ft). In Derbyshire are Kinderscout (2088 ft) and Bleaklow (2061 ft).

SCENERY THAT CHARMS BY ITS VARIETY SOUTH FROM WENSLEYDALE

The northern hills of the Pennine Chain are mostly composed of carboniferous limestone, which here and there is topped by millstone grit. Where the millstone edges are found the scenery becomes more impressive. The limestone has rounded contours, whereas the gritstone is strong and bold. The scenery that charms by its variety is mostly found southward from Wensleydale. Ribblesdale is the first

valley where individual hills stand out and command attention, the massive bulk of Ingleborough being contrasted across the valley with the fine peak of Penyghent. Perhaps the greatest change from beauty to sternness is in Upper Teesdale.

A feature of the limestone regions is the extensive honeycombing with caverns in the Ingleborough region and on the limestone side of the River Derwent and its tributaries in Derbyshire. The change from grimness to softer beauty is most suddenly seen between precipitous Kinderscout and bare Bleaklow and the quick succession of sylvan beauty in the valley of the Derwent. Kinderscout lords it over the Pennine hills of the south as Cross Fell does over the northern Pennines.

WHERE WE MUST GO TO FIND THE SPIRIT OF THE MOUNTAINS

It is, however, to the Lake District that we must go to catch the real mountain spirit, for the Earth has no mountains on an equal area excelling them in variety of beauty. It all lies within an area of thirty miles by twenty-five ; but so broken up into groups is this wonderful region that it cannot be even glanced at by passing straight through it. There is no highway from east to west, and only one from south to north, and that one, though it passes scenes of great beauty, with fine historical memories, is not representative.

None of the beauties can be adequately seen from the road. This grand highway, south to north, from Bowness or Windermere by Ambleside and Grasmere to Keswick, is at the bottom of a natural trench in which four lakes lie—Windermere, Rydal Water, Grasmere, and Thirlmere. It is beautifully wooded and shoulders of mountains rise from the road, but the mountains themselves can only be seen in peeps.

THE MOST IMPOSSIBLE ROAD IN ENGLAND FOR THOSE WHO WALK

To get anything like a general view of the mountains on this side of the group they must be viewed at a distance, from a Windermere steamer between Lakeside and Waterhead ; or by turning aside from the road at Windermere to Orrest Head, or before reaching Ambleside to Jenkin Crag on the lowest slope of Wansfell Pike. From the Lake the positions of the Kentmere range in the east, the Fairfield semi-circle in the north, the Coniston mountains (The Old Man and Wetherlam) in the west, and the Langdales can be fixed for further study.

The central road, as it approaches Keswick, does disclose the two terminal mountains, Skiddaw and Saddleback, on the north, and gives a distant view of the north-western group, in which Grisedale Pike is most conspicuous ; but the chief west-central mass, incomparably the finest of all, clustered around England's loftiest mountain, Scafell Pike, is not seen at all.

The plain truth is that the hundreds of thousands who rush across this fascinating district in motor-coaches and motor-cars, making its one thoroughfare the most impossible road in England for those who walk, think they have seen it but have not seen it, though they have had a glorious ride. Let us state, then, how the mountains can be seen.

They are grouped in seven blocks. Looked at from east to west the first is the High Street and Kentmere block, from which radiate the Fusedale, Mardale, Long Sleddale, Kentdale, and Troutbeck valleys, with Hawes Water nestling in their midst and five other waters resting on their shoulders. The only usable road into the heart of these mountains comes from the east and runs to a dead end in Mardale.

THE GLORIOUS WALK AROUND THE EDGE THE HIGH STREET PLATEAU

This block of hills, eight miles long and rising 2000 feet or more, is separated from the Helvellyn-Fairfield block by the Kirkstone Pass, between Ambleside and Patterdale, which receives its waters chiefly from the Helvellyn, or western, side. The Travellers Rest Inn, near the head of the Kirkstone Pass, is at the foot of Caudale Moor, one of the outlying heights of the High Street range. This Kirkstone Pass road, which connects Windermere with Ullswater, shears off the High Street block, and leaves these hills comparatively unvisited ; but no one knows the Lake District who does not know them

The best way to reach High Street from Ambleside is to begin the walk behind the Kirkstone Traveller's Rest, cross Caudale Moor to the extreme head of the Troutbeck Valley, and climb Thornthwaite Crag, where the Kentmere hills (Froswick, Ill Bell, and Yoke) join the High Street plateau. It is about a three-mile walk and leads to a splendid view.

From Thornthwaite Crag, on which is a large cairn, reached by a steep climb alongside a wall, the view opens out over Windermere to the sea beyond, and includes the Coniston Fells, the lofty heights round Scafell Pike, and the rugged eastern side of the Fairfield range and Helvellyn. Within a mile, north-eastward, are the steep descent into the upper vale of the River Kent from which rise the precipices of Froswick and Ill Bell, the summit of the Nan Bield Pass (2100 ft) with its entrancing view into Mardale, and, more northward, the summit of the High Street range (2718 ft), all reached by crossing to the edges of a mile-wide almost flat plateau.

Along the grassy and peaty summit of High Street once ran a Roman road, now but faintly marked.

Here, then, is a range, flat on the summit, declining gradually to the north, sending forth lateral ridges enclosing lofty rocky dales from which rise bold crags, and embosoming half a dozen lakes, large and small. Glorious prospects, from Morecambe Bay to the Pennines, are visible in a two-hours walk around the edge of the High Street plateau.

THE THIRTY SUMMITS AND FELLS OF THE HELVELLYN-FAIRFIELD RANGE

Between the car-crowded motor-road from Ambleside to Keswick and the road which winds up the steep zigzagging Kirkstone Pass from Ambleside on the way to Patterdale and Ullswater rises the Helvellyn-Fairfield range. It has at least 30 summits and fells. There are half a dozen pony tracks going up Helvellyn or crossing it to the main road, the chief being the Grisedale Pass, from Patterdale to Grasmere, reaching its highest point (1929 ft) at the junction between Helvellyn and Fairfield. The length of the Helvellyn mass above 2000 feet is seven miles as the crow flies, and the length of the continuing Fairfield mass is six miles, beginning with St Sunday's Crag and ending with Red Screes overlooking the top of the Kirkstone Pass.

The western side of Helvellyn is dull and unromantic, and its ascent presents no difficulties, though the gradient is stiff occasionally. But Helvellyn decidedly commands respect if approached from the east, whether the ascent be by the Grisedale Pass, from Grasmere, or from Patterdale, or Glenridding. The most dramatic approach is up Ullswater on a steamer. Though lumpish St Sunday's Crag and pointed Catchidecam are the most prominent heights seen at first from the lake ; the gradual revealing of Helvellyn and the Low Man as Glenridding is ascended is finely staged. The true Helvellyn looks down its precipices into the hollow where the Red Tarn lies. Scott was not exaggerating when, in his poem on the dog that watched three months in this hollow by the undiscovered body of its master, he wrote of climbing " the dark brow of the mighty Helvellyn."

THE VISION THAT GREETS US FROM THE LOFTY SUMMIT OF HELVELLYN

Wordsworth, in his poem on the same tragedy, describes the scene truly.

It was a cove, a huge recess.
That keeps till June December's snow ;
A lofty precipice in front,
A silent tarn below.
There sometimes doth a leaping fish
Send through the tarn a lonely cheer ;
The crags repeat the raven's croak,
In symphony austere.
Thither the rainbow comes, the cloud,
And mists that spread the flying shroud,
And sunbeams ; and the sounding blast
That, if it could, would hurry past ;
But that enormous barrier holds it fast.

From the top of Helvellyn (3118 ft) nearly all the principal monarchs of the district can be seen, with six lakes, and parts of the sea from Morecambe Bay to Solway Firth ; while eastward the Cross Fell Range and Ingleborough in the Pennines are clearly visible. The view from Fairfield is equally fine. Fairfield and Helvellyn meet at Grisedale Tarn near the top of Grisedale Pass, with which only the Passes of the Scafell Mountain group will compare.

The descent from Helvellyn over Dollywaggon Pike to the Grisedale Tarn is 1350 feet, and the immediate ascent from the tarn to the top of Fairfield is 1095 feet. The summits are about three miles apart. From Fairfield eight lakes are visible.

AN UP AND DOWN WALK ALONG THE CREST OF THE FAIRFIELD RANGE

The mountain drops eastward into Deepdale by magnificent cliffs, which continue the ruggedness of Helvellyn on the same side. By going to Cofa Pike, along the narrow ridge that joins Fairfield to its northern continuation, St Sunday's Crag, a view can be obtained of the sheer ruggedness of both Helvellyn and Fairfield.

An up and down walk along the whole crest of the Fairfield range, by Hart Crag and Dove Crag to Red Screes overhanging the head of the Kirkstone Pass, is the middle part of the best circular walk from Ambleside, by Nab Scar, Heron Pike, Rydal Fell, and Great Rigg to Fairfield, but it is only for stalwarts ; whereas almost anybody can reach the summits of Helvellyn and Fairfield by taking enough time. Five pony paths up Helvellyn and one up Fairfield serve those who cannot walk. The High Street summits, and still more the Scafell summits, are comparatively remote from residential or holiday centres, but Helvellyn is neighbourly.

The third separate group east of the central highway between Windermere and Keswick is the most northerly pair of all—Skiddaw and Saddleback—beyond the Penrith-to-Keswick railway. Side by side they form a mountain boundary, with Keswick town nearly at their feet.

SKIDDAW AFFORDS A FINE FRAME TO ONE OF NATURE'S CHOICE PICTURES

Skiddaw (3054 ft), the fourth in height of the Cumbrian system, is an imposing mass, best seen from Derwentwater. By far the easiest to climb and close to a considerable town, it forms a fine frame to one of Nature's choice pictures, but closer acquaintance is disappointing. In going up Skiddaw one has his back to the scenery, the forward views are ordinary, while from the top the northward outlook is commonplace. On the other hand, the descent improves at every stage, and the panorama becomes particularly fine over Derwentwater, Borrowdale, and the Newlands, from halfway down the path. It must also be said of Skiddaw that its fine buttresses seen from the Bassenthwaite road below enhance its dignity, and looked at from the Scottish side its grand uplift from the plain is welcome to English eyes.

Though the bases of Skiddaw and Saddleback run down to each other, with a single valley between, no sensible person crosses the wet waste from one to the other. The ascent of Saddleback is a separate undertaking, usually made from Scales on the Penrith road.

Saddleback (2847 ft), when climbed, is far more impressive than Skiddaw. A mile and a half of it is over 2500 feet high. The mid part, which has given it its popular name, is a lofty grassy slope, but at either end it sinks down wild precipices to deep gorges, and the whole mass has a stern grandeur fitting its high-sounding ancient name of Blencathara. In the ascent of Scales Fell Scales Tarn may be reached, deep-set at the foot of a towering cliff in a lonely recess. There are parts of the ridge of Blencathara that need careful walking. The descent toward Keswick is usually made by the farm of Derwentfolds.

WORDSWORTH'S POEM ON THE SHEPHERD LORD OF BLENCATHARA

It was on the grim slopes of Blencathara that Sir Lancelot Threlkeld (Threlkeld is now the station near the mountain) concealed as a babe and for 24 years Sir Henry Clifford from the vengeance of the House of York until Henry the Seventh became king. Then the hidden shepherd lord regained his estates.

The poet Wordsworth tells the story in his poem Lord Clifford. The child, the last of his race, lived unsuspected as the shepherd of Blencathara. When his estates were restored he was expected to "head the flock of war ;" but No.

Love had he found in huts where poor men lie ;
His daily teachers had been woods and rills,
The silence that is in the starry sky,
The sleep that is among the lonely hills.
In him the savage virtue of the Race,
Revenge, and all ferocious thoughts were dead ;
Nor did he change, but kept in lofty place
The wisdom which adversity had bred.
Glad were the vales, and every cottage hearth ;
The Shepherd-lord was honoured more and more ;
And, ages after he was laid in earth,
" The good Lord Clifford " was the name he bore.

A lovely instance this of the genius of Wordsworth in blending the spirit that is in Nature with the spirit of Man.

THE MUCH PHOTOGRAPHED FELLS AND TARNS OF THE LANGDALE PIKES

A fourth group sinking northward into lower fells rises between the central road from Grasmere to Keswick on the east, Borrowdale, Langstrath, and the Stake Pass on the west, and Langdale on the south. The conspicuous southern edge of this region is formed by the Langdale Pikes, perhaps the most photographed mountains in Lakeland. The higher Pike, Harrison Stickle (2401 ft), appears from the eastward like a lion couchant, and its mate, Pike of Stickle (2323 ft), seems to be lying alongside with only a head projecting. They gain effect by their steep descent. Really they are the rocky edge

of a plateau, ten miles long by three or four miles wide, on which are eight or nine summits about as high as themselves. The fells are swampy, and their few tracks difficult to follow.

In misty weather the stranger finds this upland region as easy to get lost in as any place in England. But Langdale Pikes are conspicuous, and so climbing people like to steer their way through the bogs behind them to High Raise (2500 ft) and Sergeant Man (2414 ft), and even to Ullscarf (2370 ft). To the north is High Seat (1996 ft), which has a remarkable range of vision paid for by wet feet.

PEAKS WHICH SEND THEIR WATERS DOWN TO NEWLANDS VALE

To the west of Derwentwater and Borrowdale, and the north of the Honister Pass and Buttermere and Crummock Water, is a fifth group of a dozen peaks that have Newlands Vale as the centre to which their eastern waters flow, while their western waters reach Buttermere, Crummock Water, or the River Cocker. They are divided into three ranges, which may be seen from above during two walks from Keswick. One walk is over Cat Bells, Maiden Moor, Eel Crags, Dale Head (2473 ft), Hindscarth (2385 ft), and Robinson (2417 ft), bold mountains the last four, at the head of Newlands Beck, and the other over the Causey Pike, Scar Crags, Eel Crag, the massive, moss-covered Grasmoor (2791 ft), across Coledale Pass to Hobcarton Crags and Grisedale Pike (2593 ft). The views, near and far, on both journeys are fine.

CAIRN-CROWNED CONISTON OLD MAN AND BULKY WETHERLAM

The sixth detached group is Coniston Fells in Lancashire, separated from the rest by the Wrynose Pass and the upper part of the River Duddon. To those who only see it from afar it is represented by the cairn-crowned Coniston Old Man and the bulky Wetherlam, but the whole mass, when known from above, is nobly moulded, with deep and craggy recesses in its sides concealing half a dozen loftily placed tarns. From Walna Scar in the south to the Wrynose Pass is a central ridge five miles long, throwing off lateral extensions east and west, Wetherlam being to the north-east. The Old Man (2663 ft) is the highest summit, but there are seven others over 2500 feet. The southern end of the mass is scarred by copper mining and the Tilberthwaite side by quarrying. The Coniston Old Man has a finer seaward view than any other height in the district.

In the dominant centre of these Lakeland giants Scafell Pike reaches 3210 feet in the middle of a block that for three miles do not fall below 2500 feet: Scafell 3162, Broad Crag 3050, Ill Crag 3040, Long Pike 2940, and Great End 2984.

Esk Hause, the highest pass in England, crosses by Great End and is the meeting-place for nearly all tracks converging toward the crowning summit. From the Hause the main ridge, losing height, goes northward to Glaramara, and south-east and north-west lateral ranges rise.

The south-east range, almost challenging in height the main ridge, goes by Esk Pike (2903 ft), Bow Fell (2960 ft), Crinkle Crags (2816 ft), and lower heights to the valley of the Duddon. The western range, beyond the Sty Head Pass, rises into the noble pyramid of Great Gable (2949 ft) and continues on the southern side of Ennerdale in Kirk Fell, the Pillar (2927 ft), and The Steeple (2746 ft), and on the northern side as Brandreth (2344 ft), and as High Crag (2443 ft), High Stile (2643 ft), and Red Pike (2479 ft).

THE GREAT CULMINATION OF ENGLAND'S GLORIOUS MOUNTAIN SCENERY

We have mentioned a dozen and a half of mountains diverging from the Scafell block, but there are fifty of 2000 feet or more. Happily, this rugged apex of Old England is preserved for free access. It is a scene worthy of England, its grim strength a foil to her gracious beauties. Wordsworth said of it:

> On the summit of the Pike, which we gained after much toil, though without difficulty, there was not a breath of air. The stillness seemed to be not of this world. We paused and kept silence to listen, and no sound could be heard. The Scafell cataracts were voiceless to us, and there was not an insect to hum in the air. Round the top not a blade of grass is to be seen. Cushions or tufts of moss, parched and brown, appear between the huge blocks and stones that lie in heaps on all sides, like skeletons or bones of the Earth not needed at the Creation, and there left to be covered with never-dying lichens. Flowers and even gems scarcely surpass in colouring some of those masses of stone which no human eye beholds, except the shepherd or traveller led thither by curiosity—and how seldom must this happen.

It is not so now, for thousands come yearly, many again and again, and as

love of every form of beauty spreads it may yet be an ambition of all of English birth to see this culmination of their country's mountain scenery. The view includes all the Lakeland mountain groups we have named, but most of the lakes are hidden in their vales. Part of Derwentwater is seen over the Sty Head Pass, part of Windermere between Bow Fell and Crinkle Crags, and part of Wastwater beyond Scafell. The calm that Wordsworth felt is a rarity.

VIEWS THAT MAY BE DESCRIED FROM THE BROW OF SCAFELL PIKE

The most distant views from Scafell Pike cannot, of course, be descried at any single visit, even when the day is clear, but the Scottish mountains and the Isle of Man are often seen, the Mourne Mountains in Ireland sometimes, and also the mountains of North Wales. Ailsa Crag has been reported. Eastward, Ingleborough is a common sight. The chief features, however, are the immediate surroundings of the dominant summit, the Mickledore Chasm between the Pike and Scafell, the fine cliffs of Scafell and Great End, the craggy dip into Eskdale, the fine array of neighbour peaks—Great Gable, Bow Fell, the Pillar—the more distant mountain masses, Helvellyn, Blencathara, and Skiddaw, the deep dales around, and the passes that climb from them to Esk Hause.

With all who travel it should be a duty to see something of this most fascinating region in all England from some mountain brows, and preferably from Scafell Pike.

SOME OF THE BEST BELOVED HEIGHTS TO BE SEEN IN ALL THE WORLD

Let us now turn to England's little hills, the best beloved heights in all the world. Apart from the Fen area of the Wash on the east coast our land is ribbed with more than a score of small hill groups. The South Downs run west from Beachy Head in Sussex to Winchester in Hampshire, reaching their greatest height of 889 feet at Butser Hill. Their grassy slopes can be seen to advantage from the Devil's Dyke near Brighton, from Ditchling Beacon six miles from that watering-place, from Blackdown near Haslemere, where Tennyson loved to walk and where he died, from Cissbury Ring near Worthing, and from Chanctonbury Ring some three miles farther inland. The Forest Ridges of the Sussex Weald, between the North and South Downs, reach to near 700 feet and are finely wooded.

The North Downs, on the whole more attractive than the South, run north-west from the South Foreland on the Kent coast to Maidstone, and there is a northerly branch to Canterbury. From Wrotham and Westerham the direction is westerly to Dorking and Guildford, the Hog's Back, and Farnham, beyond which Hampshire is entered, with Sidown Hill and Pilot Hill rising over 800 feet. From Harbledown the old Pilgrims caught their first sight of Canterbury, and from Ide Hill near Westerham we can see over the valleys of the Darent and the Medway. Other excellent viewpoints are Box Hill (590 ft), Leith Hill (965 ft), the Hog's Back, and Hindhead.

The North Downs are supposed to stop at Inkpen Beacon (1011 ft) in Berkshire, but they only change their name to the Wiltshire and Marlborough Downs on the other side of the Kennet Valley.

FOOT-ROADS WHICH HAVE BEEN TRODDEN FOR THOUSANDS OF YEARS

From Avebury, on Marlborough Downs, foot-roads have been trodden for thousands of years to the North and South Downs, and the Lambourn Downs and White Horse Hills of Berkshire which, running east to Streatley, make the Chiltern Hills of Buckinghamshire; and these, running north-east through Hertfordshire, join with the hills of Cambridgeshire near Newmarket and those of Suffolk at Bury St Edmunds, entering Norfolk by Thetford.

Similarly, in the south-west, the Mendips, the Quantocks, the Blackdowns, Exmoor, Dartmoor, Bodmin Moor, and the central Cornish hills are linked up by little intermediate heights. The Dorset Heights begin in Wiltshire, between Shaftesbury and Salisbury, and run through Dorset to Lyme Regis. On several of them are ancient camps. Pilsden Pen rises 909 feet and Bulbarrow 902 feet. To the south is the Purbeck range, culminating in Creach Barrow, with Corfe Castle in a gorge.

The Mendips of Somerset are a limestone plateau with several points slightly over 1000 feet, among them Black Down (1067 ft). On their south side they drop suddenly 800 feet. The way down to the plain, where lies historic Glastonbury beside its tor, is through the impressive grandeur of the Cheddar Gorge, with jagged precipices 400 feet high, stalactite

caves, and remains of prehistoric life. The Quantocks, more interesting for their literary associations and more picturesque in their quiet beauty, are about 12 miles long and 3 miles broad. The Brendons, separated from the Quantocks by a valley about two miles wide, are only cut off from Exmoor by the Dulverton-Dunster road. They culminate in Lype Hill (1391 ft).

On the borderland of Exmoor wild land and sea views, colour and romance, arrest the traveller as the moor comes down the coast from Lynton to Porlock. But its heart is primitive and untamed. About 120 square miles of it are above 1000 feet high. Its highest peak, Dunkery Beacon, reaches 1707 feet. On the Devon border is the Doone Valley. Dartmoor, which covers about 200 square miles between Brent and Okehampton, is, like Exmoor, wild and waterlogged in parts, Yes Tor and High Willhays rising 2000 feet. Below the 1000-feet line, however, trees appear, the little valleys smile, and rippling waters sing and babble.

Cornwall is undulating, but where the rocky summits of Brown Willy (1380 ft) and Rough Tor (1296 ft) top Bodmin Moor the born hill-lover will be well satisfied.

THE COTSWOLDS, WHERE VILLAGES AND LOVELY LITTLE CHURCHES HIDE

Coming to the valley of the Bristol Avon we reach the Cotswolds, a medley of sheep pastures where lonely villages and lovely little churches hide. One of the most important hill systems of southern England, the Cotswolds are the source of all the rivers that reach the Thames above Oxford. They run north-east from Bath through Gloucestershire and Oxfordshire to the borders of Northamptonshire and touch both Worcestershire, where is Bredon Hill (960 feet), and Warwickshire, where is historic Edgehill. On the east their long slopes are seamed with valleys and on the west they overlook the plain of the Severn, the mountains of South Wales, and the Malvern Hills. Cleeve Cloud, east of Cheltenham; Birdlip, south of that city; and Broadway Hill, in the far north, are famous viewpoints.

The Chilterns are an attractive range of chalk hills running from Goring-on-Thames for nearly sixty miles in a north-easterly direction. They continue the line of the White Horse Hills of Berkshire, cross south Oxfordshire, are most conspicuous in Buckinghamshire, spread over south Bedfordshire and Hertfordshire, and pass on into Cambridgeshire, Essex, Suffolk, and the East Anglian heights. They are gentle, grassy, and on their lower slopes well wooded. Their greatest height is about 900 feet, their general level between 500 and 600.

WHERE THE MALVERN HILLS RISE BOLDLY FROM THE SEVERN PLAIN

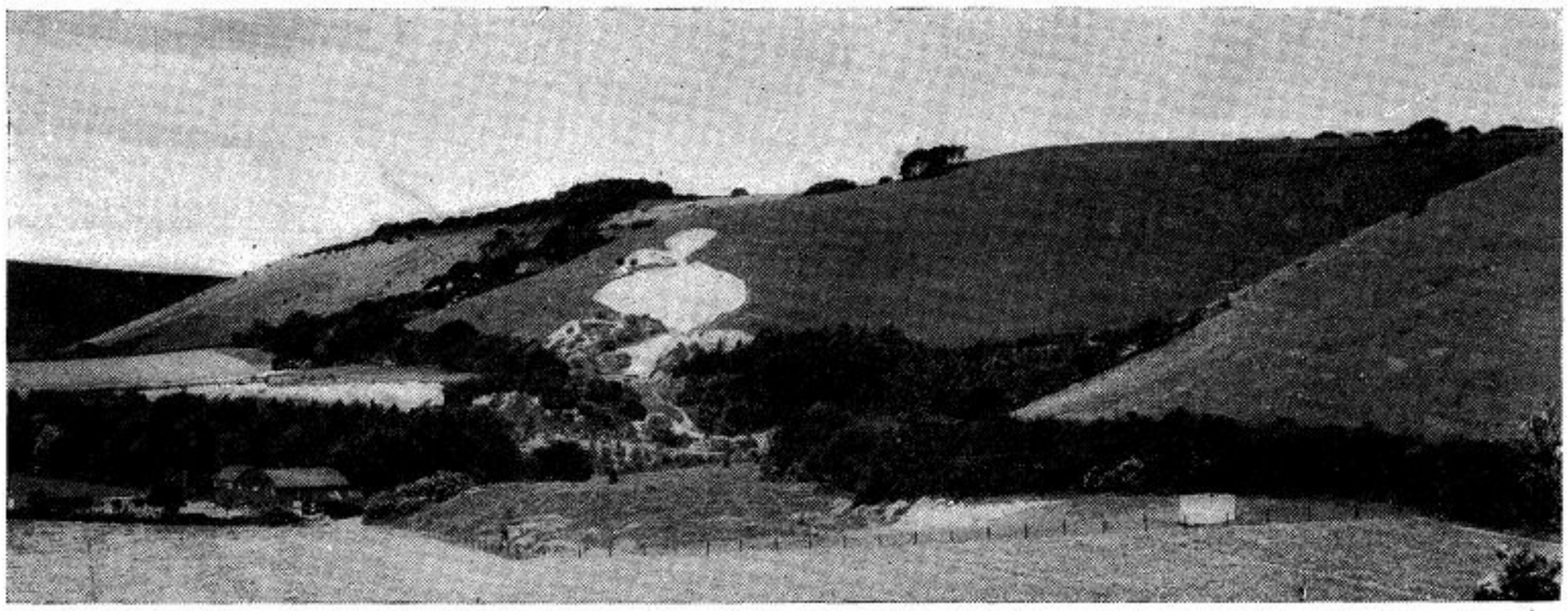
The Malvern Hills, in Worcestershire and Herefordshire, rise boldly from the Severn Plain. From Worcestershire Beacon (1395 ft) may be seen a long stretch of the Cotswolds, the Clee Hills of Shropshire, and the Black Mountains of South Wales. The Clee Hills rise near the hill town of Ludlow, Titterton Clee 1749 ft and Brown Clee 50 feet higher. In a line with the wooded Edge of Wenlock is the Wrekin (1335 ft). At Church Stretton Long Mynd rises 1674 feet.

In north Leicestershire is Charnwood Forest, a plateau with 6000 acres above 600 feet, rising here and there into granite outcrops. Bardon Hill reaches 912 feet. From the summits of the Forest ridge Leicester, Nottingham, Derby, and Coventry may be easily seen if the weather is at all favourable. In Lincolnshire, from Rutland northward, the land is undulating up to more than 300 feet for a width of four or five miles, and beyond Grantham a range known as The Cliff continues to Lincoln. Farther north the ridge, less plainly marked, continues to the Humber, but gathers again at Burton Stather (200 ft). Between Spilsby and the Humber are the Lincolnshire Wolds. Midway, south of Caistor, the ridge reaches 525 feet.

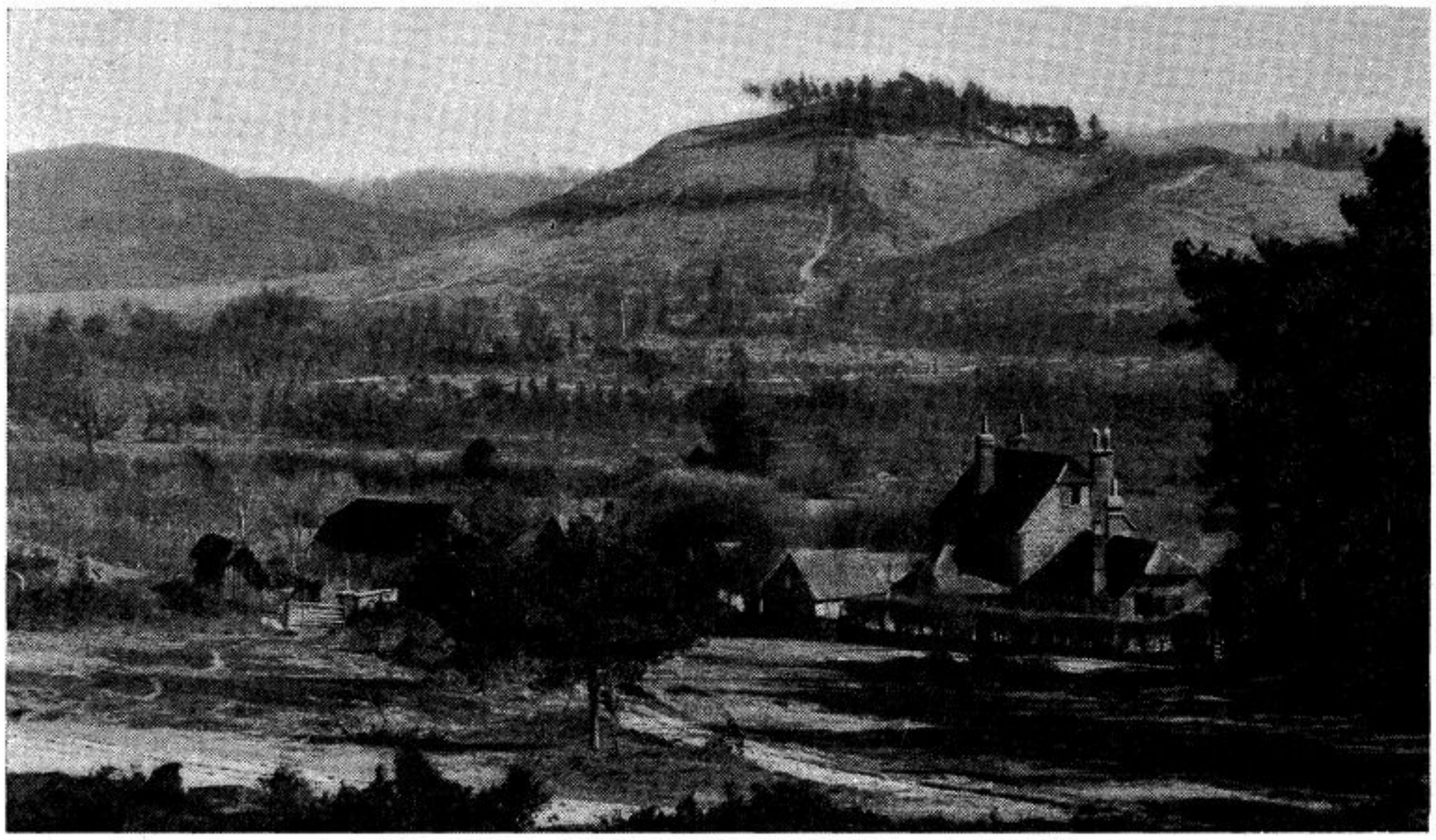
THE LITTLE KNOWN SOLITUDES OF THE GREAT MOORS

On the east of Yorkshire are the Wolds, with some points of between 500 and 600 feet. At Malton the Howardian Hills link the Wolds with the Hambleton Hills. The Yorkshire Moors, between the Tees and the Derwent, include the Cleveland ironstone district which, at Boultby Cliff (666 ft), near Staithes, has the loftiest headland on the English coast. A final ridge fronts the Yorkshire Plain east of Northallerton and Thirsk, its highest point, Black Hambleton, rising 1289 feet. The hills stretch from the Hambleton escarpment to Scarborough and Whitby. Comparatively few people know the inner recesses of the Yorkshire Moors, but those who do love them for ever.

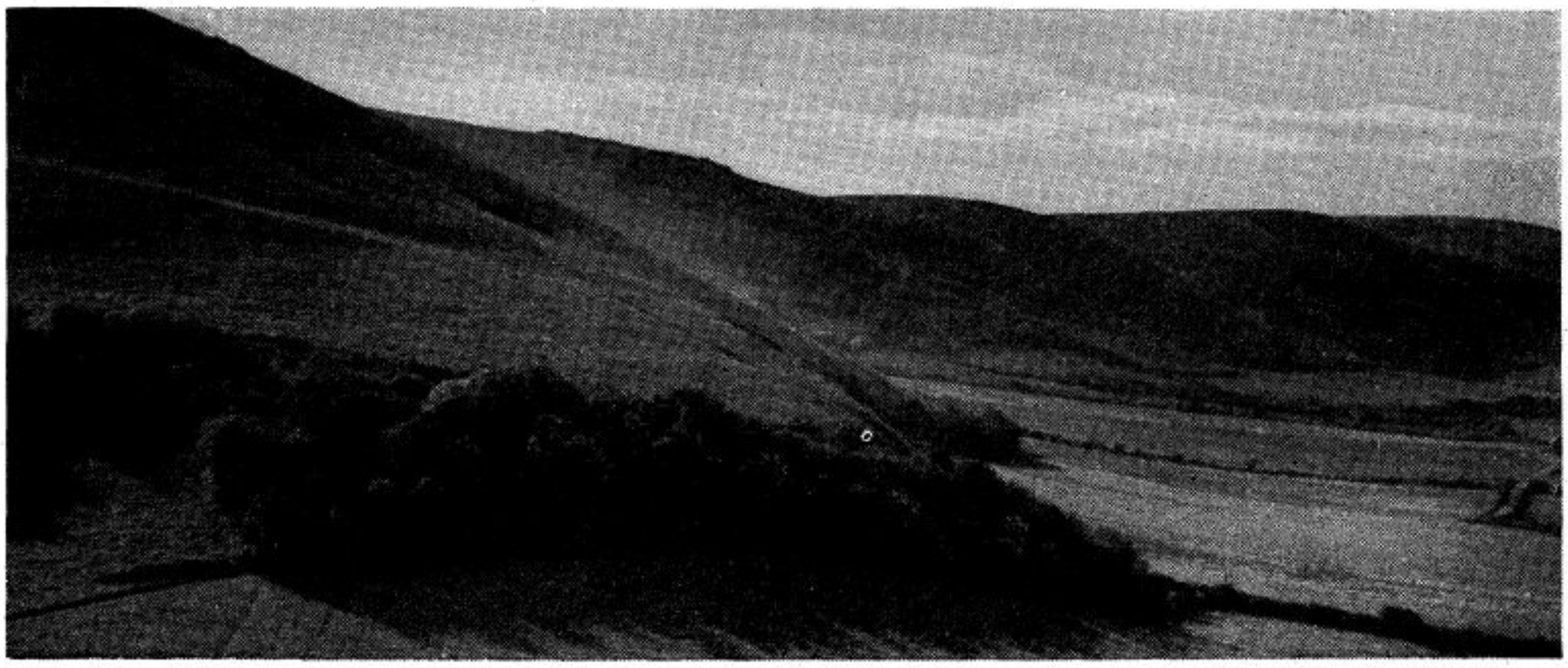
HILLS & MOUNTAINS OF ENGLAND



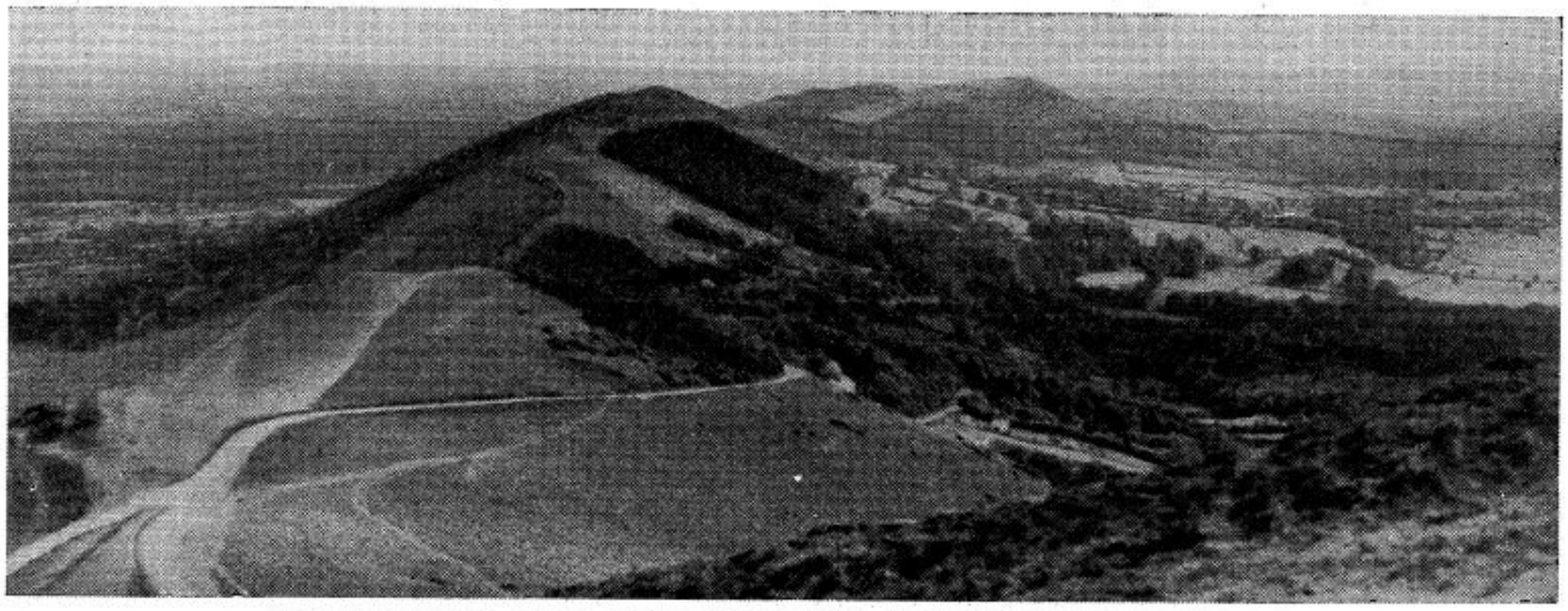
THE NORTH DOWNS NEAR REIGATE



THE DEVIL'S JUMPS NEAR HINDHEAD IN SURREY



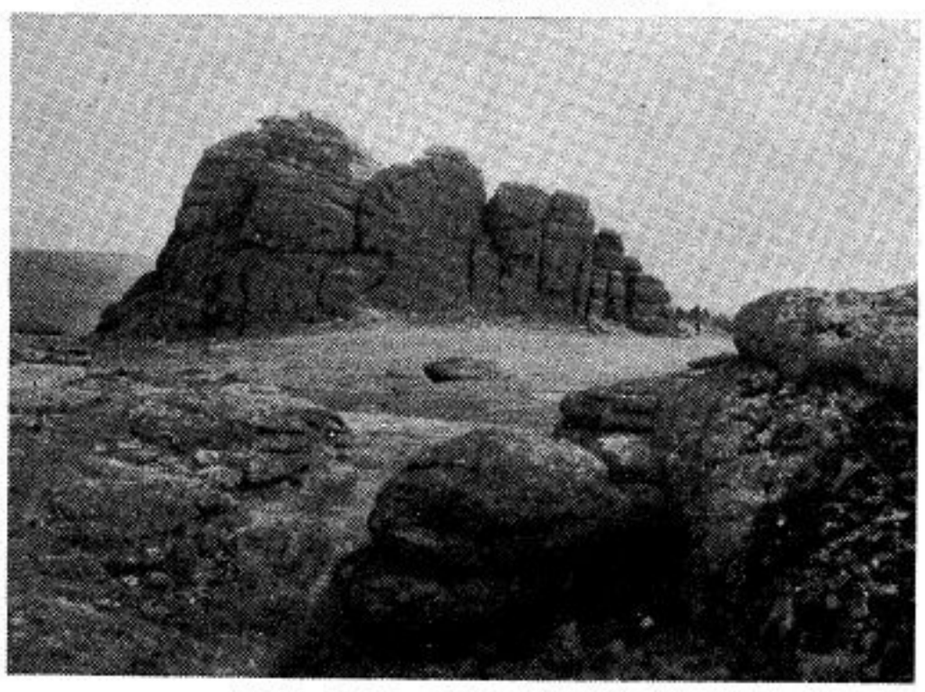
THE SOUTH DOWNS NEAR SADDLESCOMB IN SUSSEX



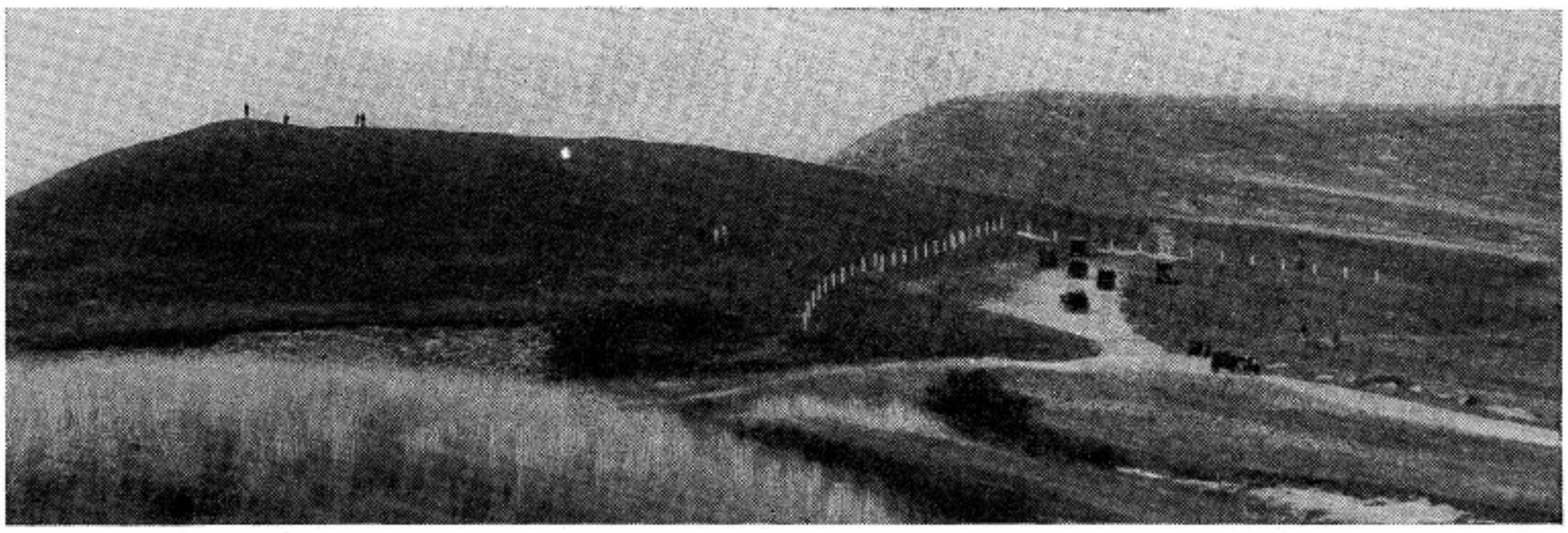
THE MALVERN HILLS SEEN FROM THE WORCESTERSHIRE BEACON

CARDING MILL VALLEY IN THE LONG MYND, A SHROPSHIRE HILL RANGE

THE HAMBLETON HILLS IN YORKSHIRE



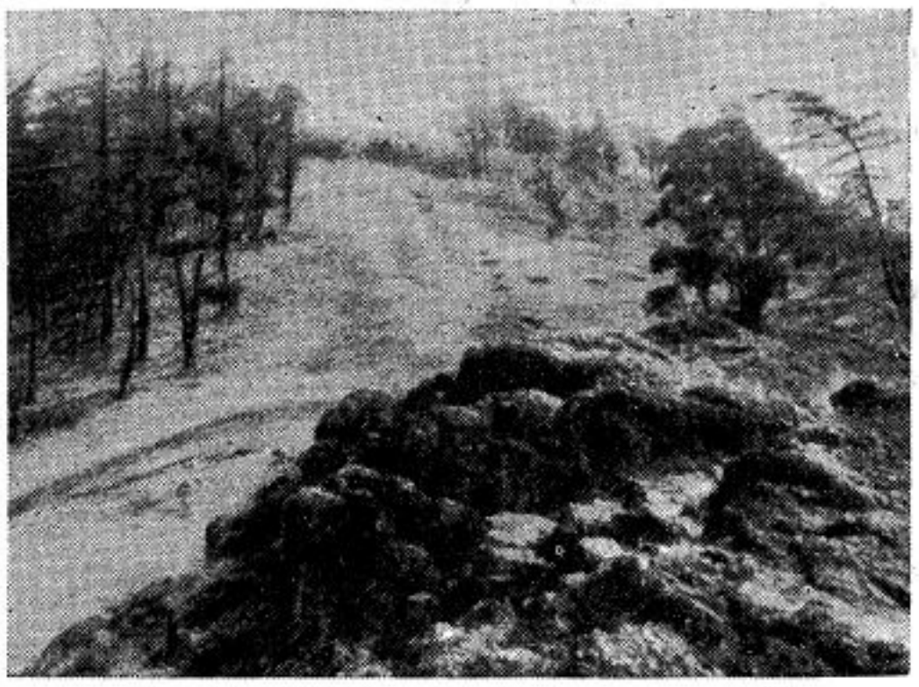
HAY TOR ON DARTMOOR



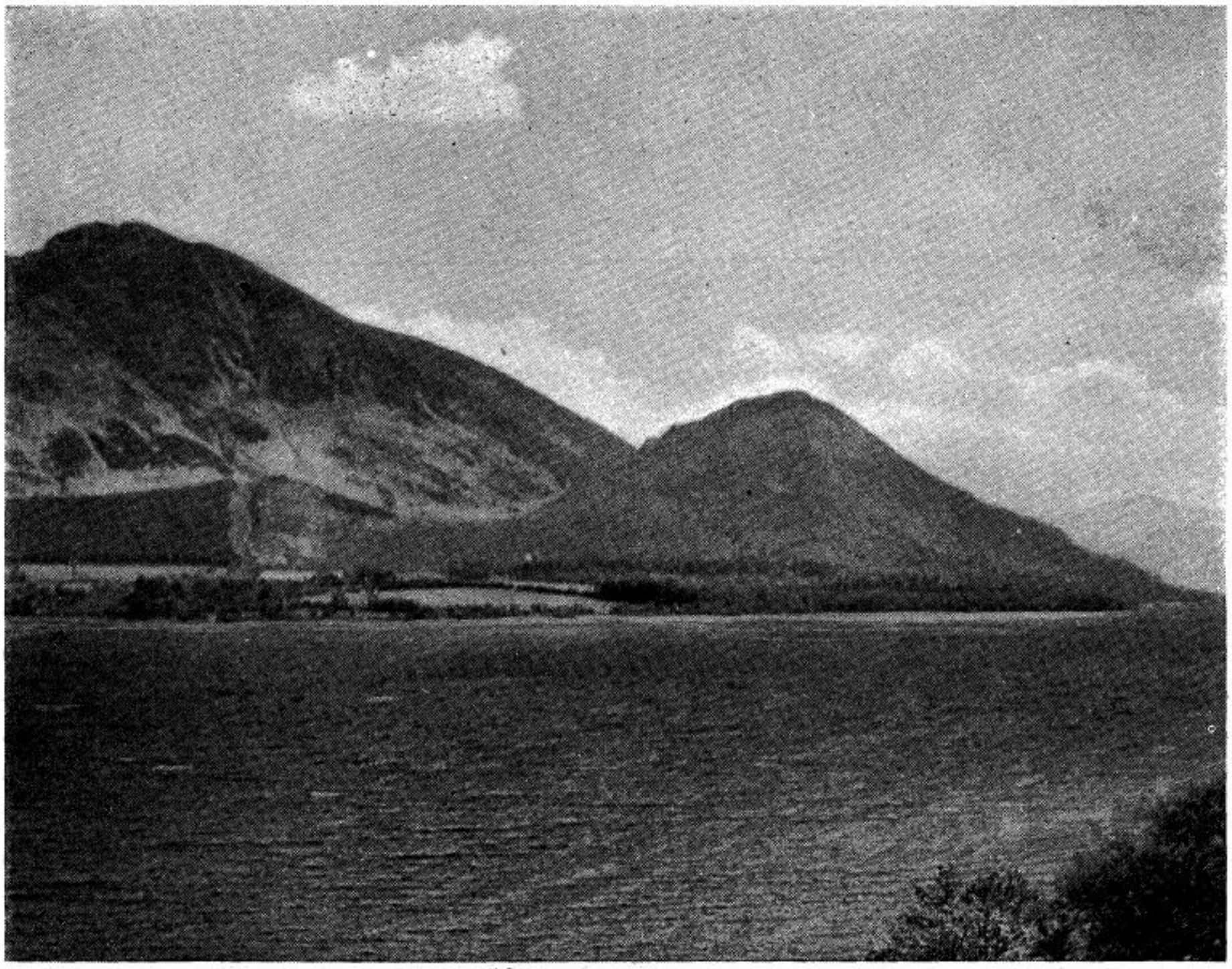
IVINGHOE BEACON IN THE CHILTERN HILLS

THE SOUTH DOWNS NEAR BRAMBER IN SUSSEX

THE CLEVELAND HILLS IN YORKSHIRE



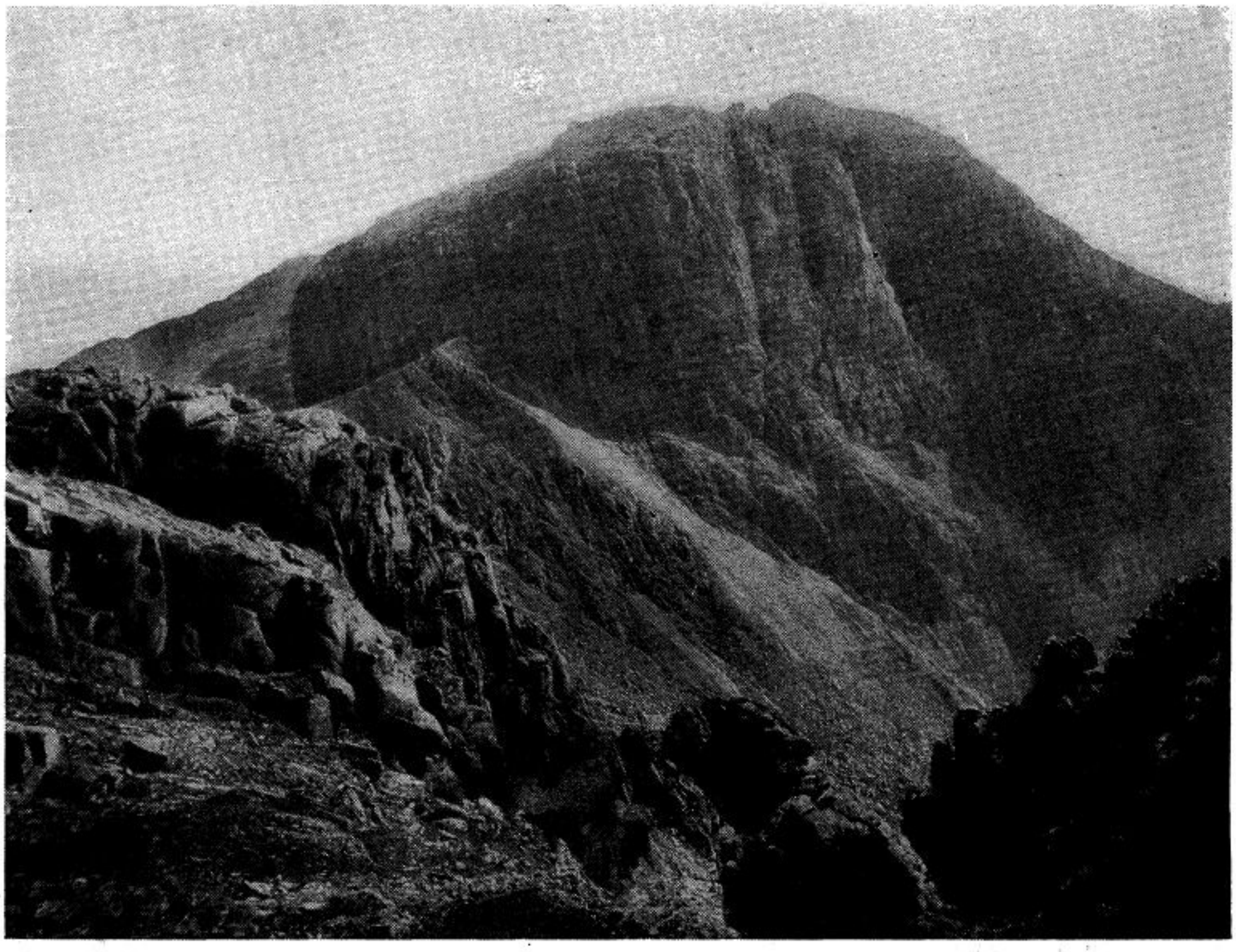
THE WREKIN IN SHROPSHIRE



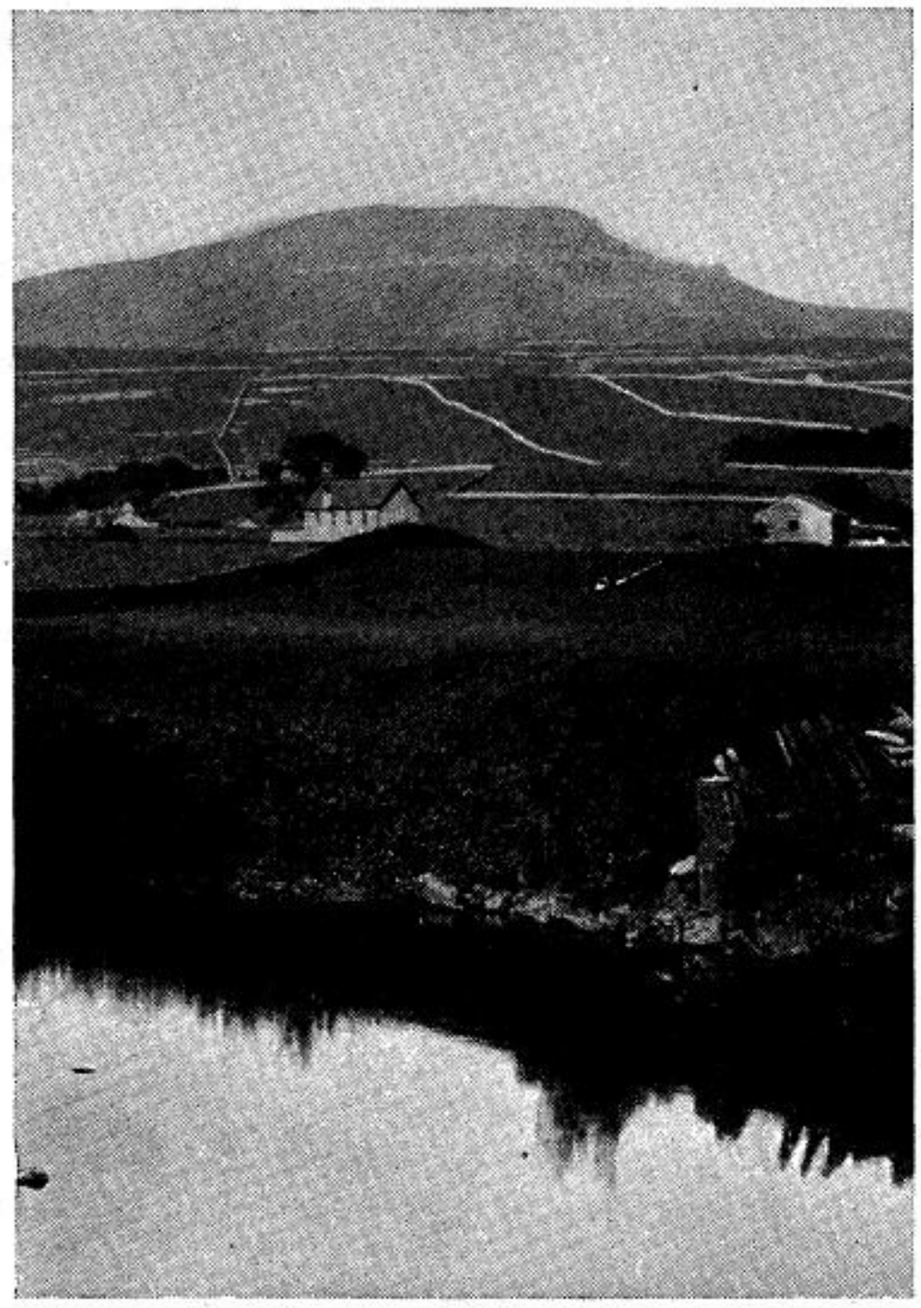
SKIDDAW AS SEEN ACROSS BASSENTHWAITE LAKE IN CUMBERLAND

LANGDALE PIKES IN THE LAKE DISTRICT

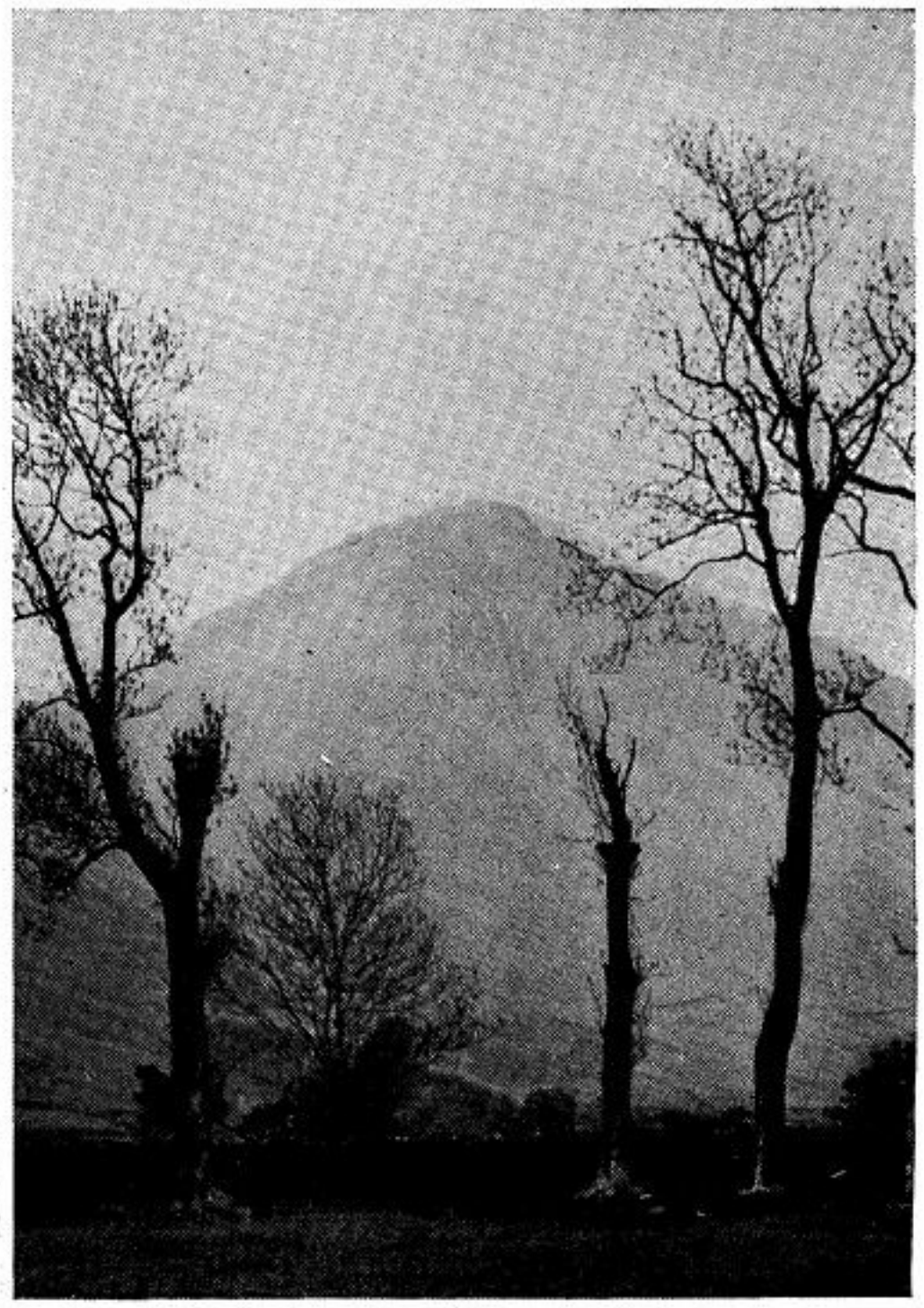
STRIDING EDGE, HELVELLYN, ON THE WESTMORLAND AND CUMBERLAND BORDER



SCAWFELL IN CUMBERLAND, ENGLAND'S HIGHEST MOUNTAIN



PEN-Y-GHENT IN THE PENNINES NEAR SETTLE



GREAT GABLE, ONE OF LAKELAND'S FINEST VIEWPOINTS

HOW EVERY WISE CHILD SHOULD LIVE

If I want to be happy
And quick on my toes,
I must bite my food slowly
And breathe through my nose.

I must press back my shoulders,
And hold up my head,
And *not* close my window
When going to bed.

I must soap my bath-flannel,
And scrub all I know ;
I must then take a towel
And rub till I glow.

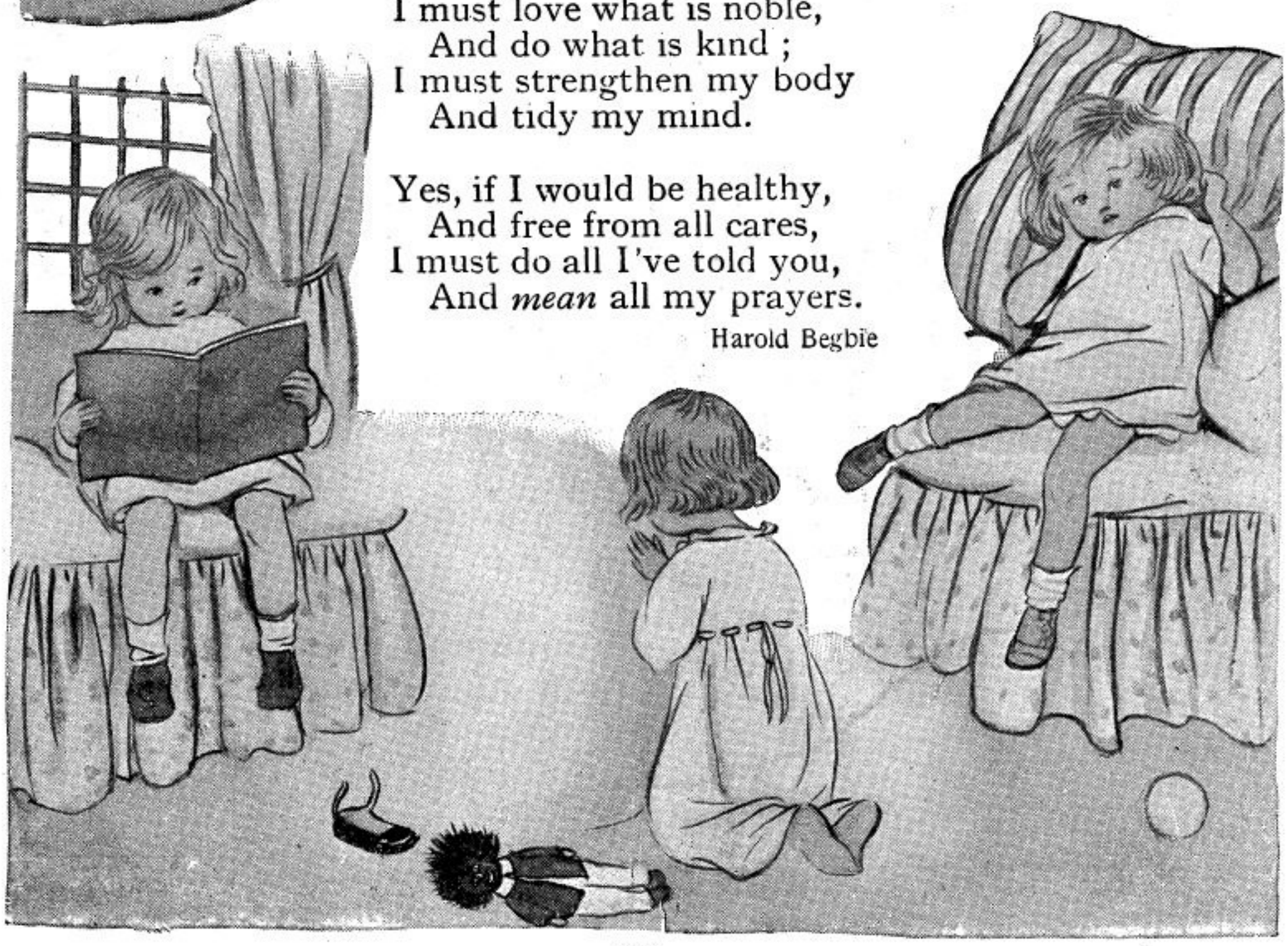
I must never be idle,
And loll in my chair ;
Or shout like a demon,
And act like a bear.

I must play and not fidget,
Read books and not flop!
Begin all with a purpose,
And know when to stop.

I must love what is noble,
And do what is kind ;
I must strengthen my body
And tidy my mind.

Yes, if I would be healthy,
And free from all cares,
I must do all I've told you,
And *mean* all my prayers.

Harold Begbie



One Thousand Poems of All Times and All Countries

THE CRY OF THE CHILDREN

Callous as the heart of England was when Lord Shaftesbury was seeking to save the children from their slavery, this poem by Mrs. Browning, not quite complete here, stirred the nation to the depths, and led to a great awakening.

Do ye hear the children weeping, O my brothers,
Ere the sorrow comes with years?
They are leaning their young heads against their mothers,
And *that* cannot stop their tears.
The young lambs are bleating in the meadows,
The young birds are chirping in the nest;
The young fawns are playing with the shadows,
The young flowers are blowing toward the west.
But the young, young children, O my brothers,
They are weeping bitterly!
They are weeping in the playtime of the others,
In the country of the free.

Do ye question the young children in their sorrow
Why their tears are falling so?
The old man may weep for his tomorrow
Which is lost in Long Ago;
The old tree is leafless in the forest,
The old year is ending in the frost,
The old wound, if stricken, is the sorest,
The old hope is hardest to be lost.
But the young, young children, O my brothers!
Do you ask them why they stand
Weeping sore before the bosoms of their mothers
In our happy Fatherland?

For oh, say the children, we are weary,
And we cannot run or leap;
If we cared for any meadows it were merely
To drop down in them and sleep.
Our knees tremble sorely in the stooping;
We fall upon our faces trying to go,
And underneath our heavy eyelids drooping
The reddest flower would look as pale as snow.
For all day we drag our burden, tiring,
Through the coal-dark underground;
Or all day we drive the wheels of iron
In the factories, round and round.

And all day the wheels are droning, turning;
Their wind comes in our faces,
Till our hearts turn—our heads, with pulses burning,
And the walls turn in their places.
Turns the sky in the high window blank and reeling,
Turns the long light that droppeth down the wall;
Turn the black flies that crawl along the ceiling—
All are turning, all the day, and we with all.
And all day the iron wheels are droning,
And sometimes we could pray:
O ye wheels (breaking out in a mad moaning),
Stop—be silent for today!

Ay, be silent! Let them hear each other breathing
For a moment, mouth to mouth!

Let them touch each other's hands in a fresh wreathing
Of their tender, human youth!
Let them feel that this cold, metallic motion
Is not all the life God fashions or reveals;
Let them prove their living souls against the notion
That they live in you, or under you, O wheels!
Still, all day, the iron wheels go onward,
Grinding life down from its mark;
And the children's souls, which God is calling sunward,
Spin on blindly in the dark.

Now tell the poor young children, O my brothers,
To look up to Him and pray;
So the blessed One, who blesseth all the others,
Will bless them another day.
They answer, "Who is God that He should hear us,
While the rushing of the iron wheels is stirred?
When we sob aloud the human creatures near us
Pass by, hearing not, or answer not a word.
And we hear not (for the wheels in their resounding)
Strangers speaking at the door;
Is it likely God, with angels singing round Him,
Hears our weeping any more?"

And well may the children weep before you!
They are weary ere they run;
They have never seen the sunshine, nor the glory
Which is brighter than the sun.
They know the grief of man, without its wisdom;
They sink in man's despair, without its calm—
Are slaves, without the liberty in Christdom,
Are martyrs, by the pang without the palm;
Are worn as if with age, yet unretrievingly
The harvest of its memories cannot reap,
Are orphans of the earthly love and heavenly.
Let them weep! Let them weep!

They look up with their pale and sunken faces,
And their look is dread to see;
For they mind you of their angels in high places,
With eyes turned on Deity.
"How long," they say, "how long, O cruel nation,
Will you stand to move the world on a child's heart,
Stifle down with a mailed heel its palpitation,
And tread onward to your throne amid the mart?
Our blood splashes upward, O gold-heaper,
And your purple shows its path!
But the child's sob in the silence curses deeper
Than the strong man in his wrath!"

LIFE

Mrs. Barbauld (1743–1825), a well-known writer in her day, was the author of these thoughtful lines, in which there is the quiet beauty of a contented and hopeful spirit.

LIFE! I know not what thou art,
But know that thou and I must part;
And when, or how, or where we met
I own to me's a secret yet.

Life! We've been long together,
Through pleasant and through cloudy weather.
'Tis hard to part when friends are dear,
Perhaps 'twill cost a sigh, a tear;
Then steal away, give little warning;
Choose thine own time;
Say not good-night, but in some brighter clime
Bid me good-morning.

LITTLE LAMB

This is one of the curiously beautiful little poems written by William Blake. He loved this world, but the idea of a spiritual world made a haunting appeal to him.

LITTLE lamb, who made thee?
Dost thou know who made thee?
Gave thee life, and bade thee feed
By the stream and o'er the mead;
Gave thee clothing of delight,
Softest clothing, woolly, bright;
Gave thee such a tender voice,
Making all the vales rejoice?
Little lamb, who made thee?
Dost thou know who made thee?

Little lamb, I'll tell thee;
Little lamb, I'll tell thee:
He is callèd by thy name,
For He calls himself a lamb.
He is meek and He is mild,
He became a little child.
I a child, and thou a lamb,
We are callèd by His name.
Little lamb, God bless thee!
Little lamb, God bless thee!

ANNIE LAURIE

When William Douglas wrote this song he reached at once the pinnacle of fame and of merit as a song-writer. It has every quality of the perfect love-song—simplicity, poetical imagery, and a delicate passion of tenderness unsurpassed. The light of romance is shed for ever on Maxwelton braes by this burst of pure feeling.

MAXWELTON braes are bonnie
Where early fa's the dew,
And it's there that Annie Laurie
Gie'd me her promise true—
Gie'd me her promise true,
Which ne'er forgot will be ;
And for bonnie Annie Laurie
I' d lay me doune and dee.

Her brow is like the snawdrift,
Her throat is like the swan,
Her face it is the fairest
That e'er the sun shone on—
That e'er the sun shone on ;
And dark blue is her ee ;
And for bonnie Annie Laurie
I'd lay me doune and dee.

Like dew on the gowan lying
Is the fa' o' her fairy feet ;
Like the winds in summer sighing,
Her voice is low and sweet—
Her voice is low and sweet ;
And she's a' the world to me ;
And for bonnie Annie Laurie
I'd lay me doune and dee.

SAY NOT THE STRUGGLE NAUGHT AVAILETH

Arthur Hugh Clough was a noteworthy poet who never made his full genius felt. Born at Liverpool on New Year's Day, 1819, he died at Florence on November 13, 1861. His poetry is not only beautiful in form but is weighted with thought, and these four short verses make up a little gem of poetic form and enlarging thought. They are a warning to us not to take a narrow view of life.

SAY not the struggle naught availeth,
The labour and the wounds are vain,
The enemy faints not, nor faileth,
And as things have been they remain.

If hopes were dupes, fears may be liars ;
It may be, in yon smoke concealed,
Your comrades chase e'en now the fliers,
And, but for you, possess the field.

For while the tired waves, vainly breaking,
Seem here no painful inch to gain,
Far back, through creeks and inlets making,
Comes silent, flooding in, the main.

And not by eastern windows only,
When daylight comes, comes in the light ;
In front the sun climbs slow, how slowly,
But westward, look, the land is bright !

THE SONG OF THE BOW

This vigorous song, with the ring of open-air England in it, is given here by the courtesy of its author, Sir Arthur Conan Doyle. It is from his "Songs of Action," but was first printed in his tale of early English life "The White Company," one of the best historical stories. It is supposed to be sung by a bowman at a New Forest meeting.

WHAT of the bow ?
The bow was made in England,
Of true wood, of yew wood,
The wood of English bows ;
So men who are free
Love the old yew tree,
And the land where the yew tree grows.

What of the cord ?
The cord was made in England :
A rough cord, a tough cord,
A cord that bowmen love ;
And so we will sing
Of the hempen string,
And the land where the cord was wove.

What of the shaft ?
The shaft was cut in England :
A long shaft, a strong shaft,
Barbed and trim and true ;
So we'll drink altogether
To the grey goose-feather,
And the land where the grey goose flew.

What of the mark ?
Ah ! seek it not in England :
A bold mark, our old mark,
Is waiting over-sea.
When the strings harp in chorus,
And the lion flag is o'er us,
It is there that our mark will be.

What of the men ?
The men were bred in England :
The bowmen, the yeomen,
The lads of dale and fell.
Here's to you—and to you !
To the hearts that are true,
And the land where the true hearts dwell.

LIGHT

This lovely example of a simile, with an exquisite meaning, cast into simple verse by perfect art, is from the pen of Francis William Bourdillon (1852–1921).

THE night has a thousand eyes,
And the day but one ;
Yet the light of the bright world dies
With the dying sun.

The mind has a thousand eyes,
And the heart but one ;
Yet the light of a whole life dies
When love is done.

LITTLE VERSES FOR VERY LITTLE PEOPLE

It is a great pleasure to be able to give to the children of the world the happy verses, on this page and the next, by Miss Laurence Alma-Tadema, daughter of Sir Lawrence Alma-Tadema, whose pictures of the glory of Greece and Rome are so widely known. Many of these verses have been set to music.

MARCH MEADOWS

A Lark

Lark-bird, lark-bird, soaring high,
Are you never weary?
When you reach the empty sky
Are the clouds not dreary?
Don't you sometimes long to be
A silent goldfish in the sea?

Goldfish, goldfish, diving deep,
Are you never sad, say?
When you feel the cold waves creep
Are you really glad, say?
Don't you sometimes long to sing
And be a lark-bird on the wing?

Lambs

O little lambs! the month is cold,
The sky is very grey;
You shiver in the misty grass
And bleat in all the winds that pass;
Wait! when I'm big—some day—
I'll build a roof to every fold.

But now that I am small I'll pray
At mother's knee for you;
Perhaps the angels with their wings
Will come and warm you, little things;
I'm sure that, if God knew,
He'd let the lambs be born in May.

A TWILIGHT SONG

Baby moon, 'tis time for bed,
Owlet leaves his nest now;
Hide your little horned head
In the twilight west now;
When you're old and round and bright
You shall stay and shine all night.

Baby girl is going, too,
In her bed to creep now;
She is little, just like you,
Time it is to sleep now;
When she's old and tired and wise
She'll be glad to close her eyes.

THE NESTING HOUR

Robin-friend has gone to bed,
Little wing to hide his head;
Mother's bird must slumber too,
Just as baby robins do.
When the stars begin to rise
Birds and babies close their eyes.

THE LITTLE SISTER

Bath-time

Baby's got no legs at all;
They're soft and pinky, crumpled things.
If he stood up he'd only fall;
But then, you see, he's used to wings.

Bed-time

Baby, baby, bye,
Close your little eye!
When the dark begins to creep
Tiny-wees must go to sleep.

Lammy, lammy, lie,
I am seven, I;
Little boys must sleep and wait
If they want their bed-time late.

Fidgy, fidgy, fie,
There's no need to cry!
Soon you'll never dress in white,
But sit up working half the night.

PLAYGROUNDS

In summer I am glad
We children are so small,
For we can see a thousand things
That men can't see at all.

They don't know much about the moss
And all the stones they pass;
They never lie and play among
The forests in the grass.

They walk about a long way off;
And, when we're at the sea,
Let father stoop as best he can
He can't find things like me.

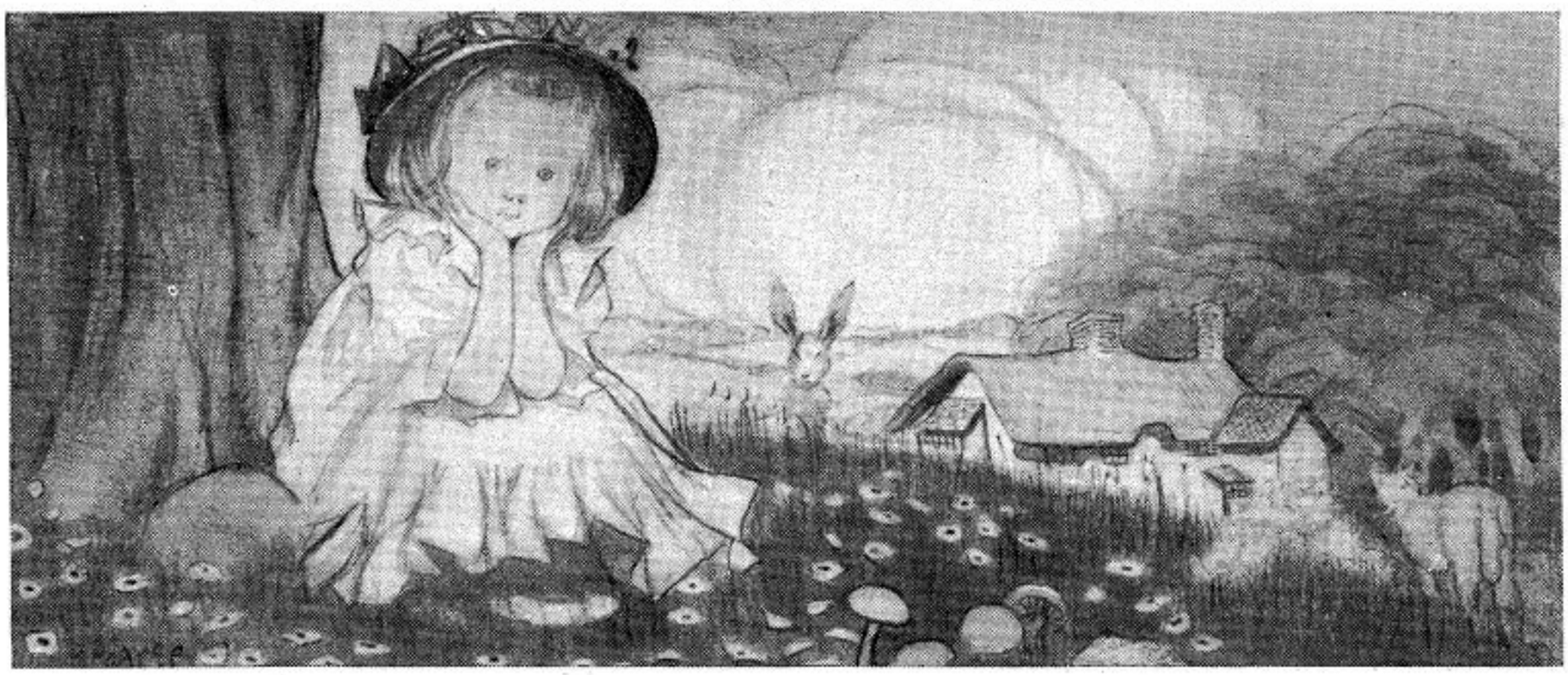
But when the snow is on the ground,
And all the puddles freeze,
I wish that I were very tall,
High up above the trees.

THE NEW PELISSE

Baby's got a new pelisse,
Very soft and very neat,
Like a lammy in her fleece
She's all white from head to feet.

Thirty lambs each gave a curl,
Mother sewed them, stitch by stitch—
All to clothe a baby girl:
Don't you think she's very rich?

IF NO ONE EVER MARRIES ME



If no one ever marries me—
And I don't see why they should;
For nurse says I'm not pretty,
And I'm seldom very good—
If no one ever marries me
I shan't mind very much;
I shall buy a squirrel in a cage,
And a little rabbit hutch.

I shall have a cottage near a wood,
And a pony of my own,
And a little lamb quite neat and clean
That I can take to town.
And when I'm getting really old,
At twenty-eight or nine,
I shall buy a little orphan girl
And bring her up as mine.

KING BABY ON HIS THRONE

King Baby on his throne
Sits reigning O, sits reigning O!
King Baby on his throne
Sits reigning all alone.

His throne is mother's knee,
So tender O, so tender O!
His throne is mother's knee,
Where none may sit but he.

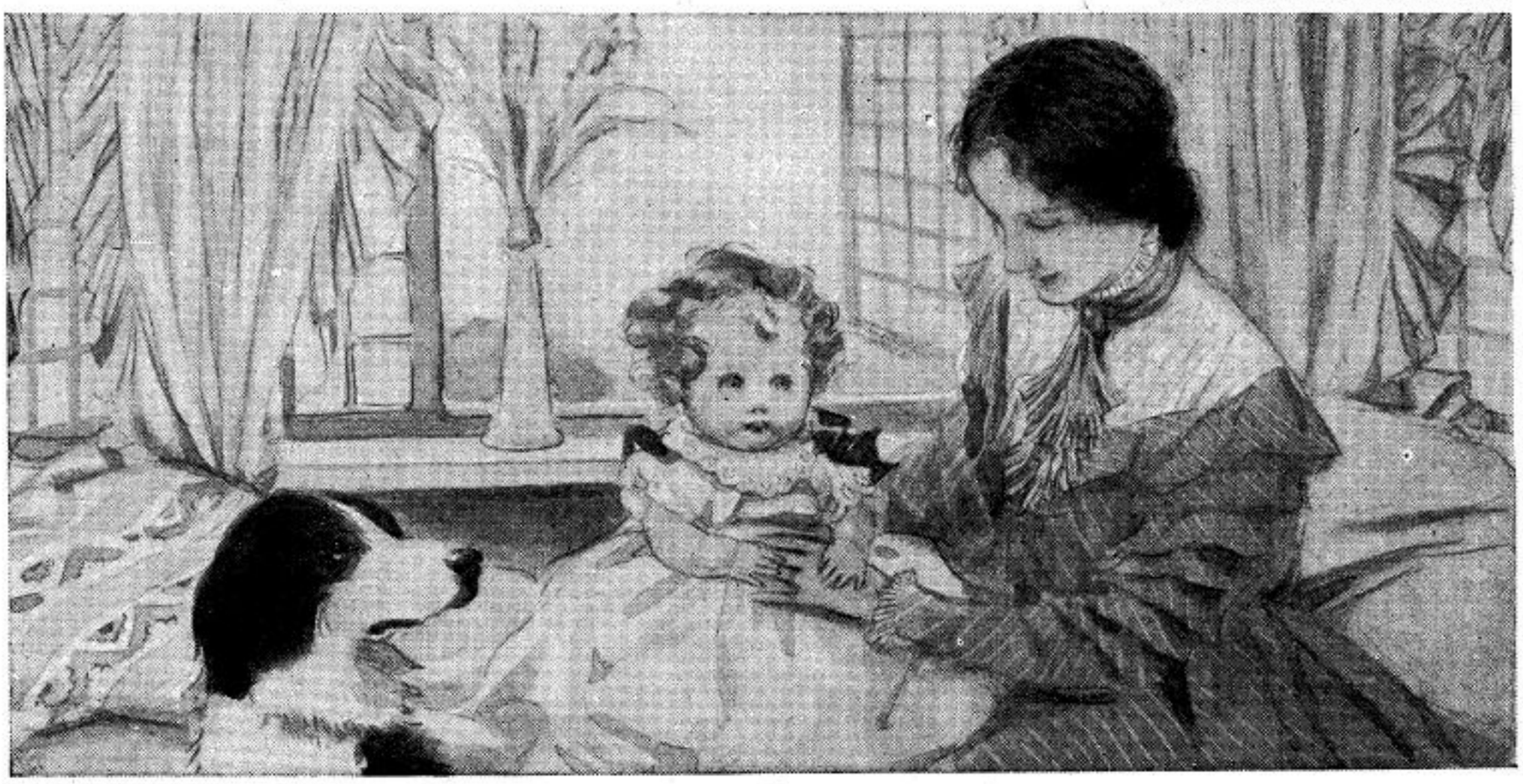
His crown it is of gold,
So curly O, so curly O!
His crown it is of gold,
In shining tendrils rolled.

His kingdom is my heart,
So loyal O, so loyal O!
His kingdom is my heart,
His own in every part.

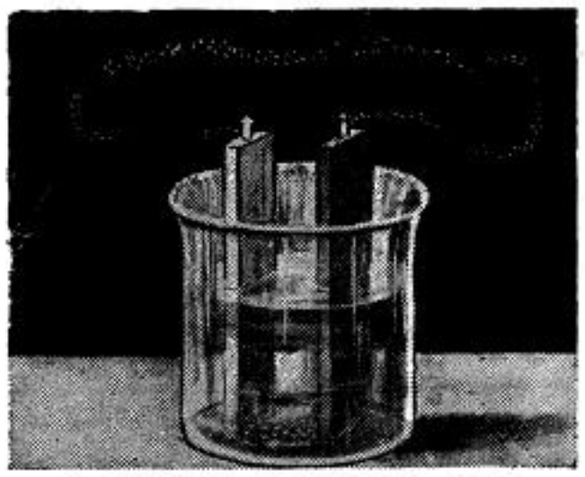
Divine are all his laws,
So simple O, so simple O!
Divine are all his laws,
With love for end and cause.

King Baby on his throne
Sits reigning O, sits reigning O!
King Baby on his throne
Sits reigning all alone.

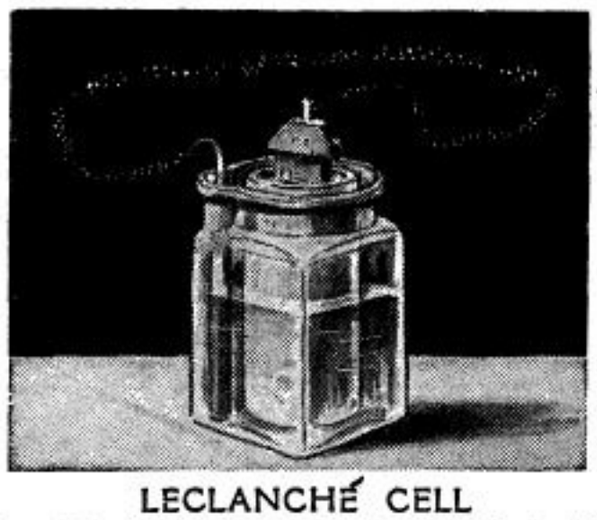
Laurence Alma-Tadema



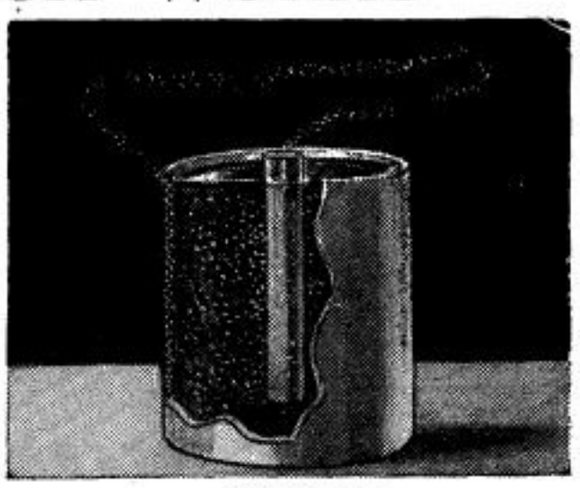
HOW YOUR ELECTRIC TORCH WORKS



A SIMPLE FORM OF CELL

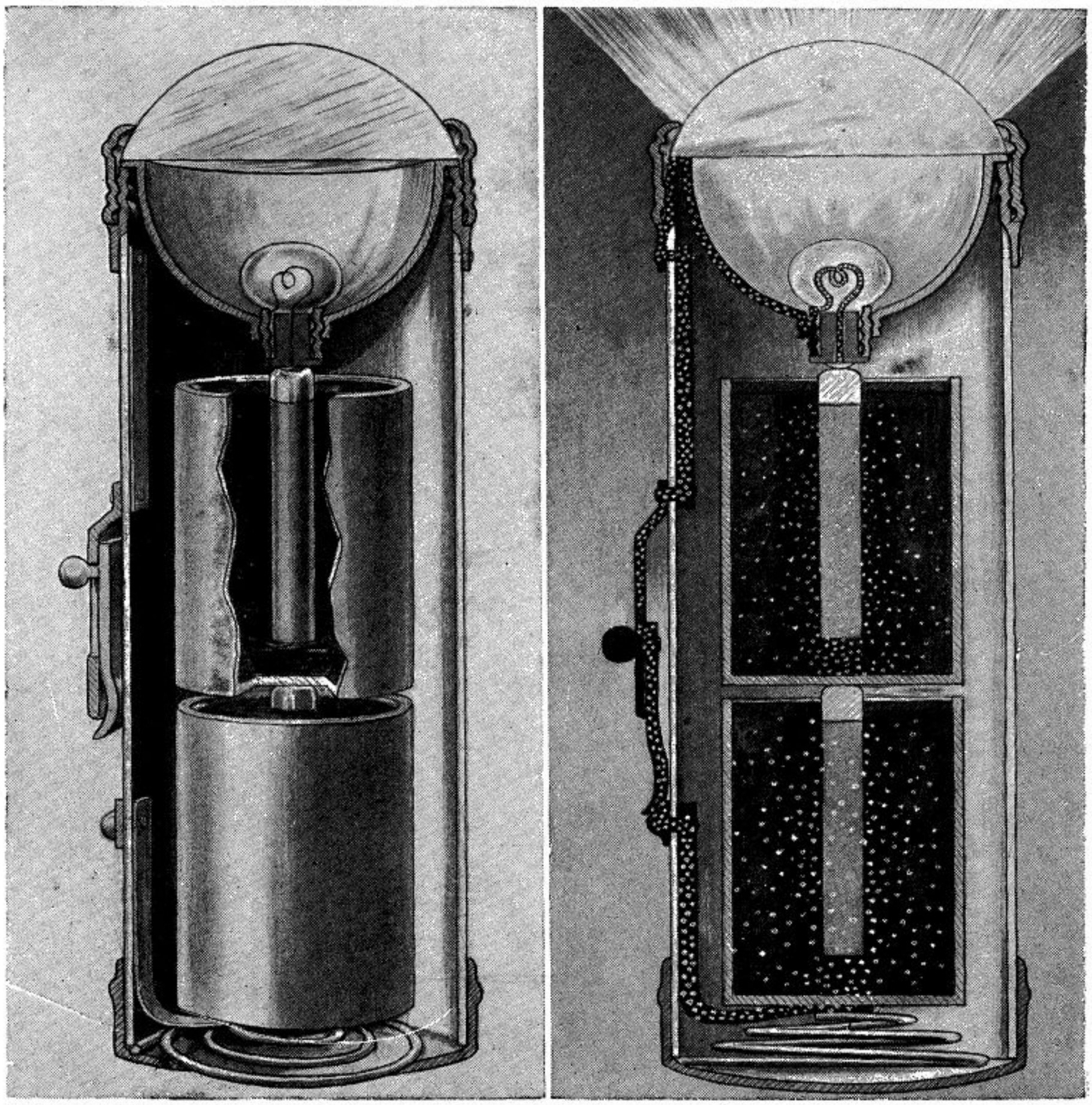


LECLANCHÉ CELL

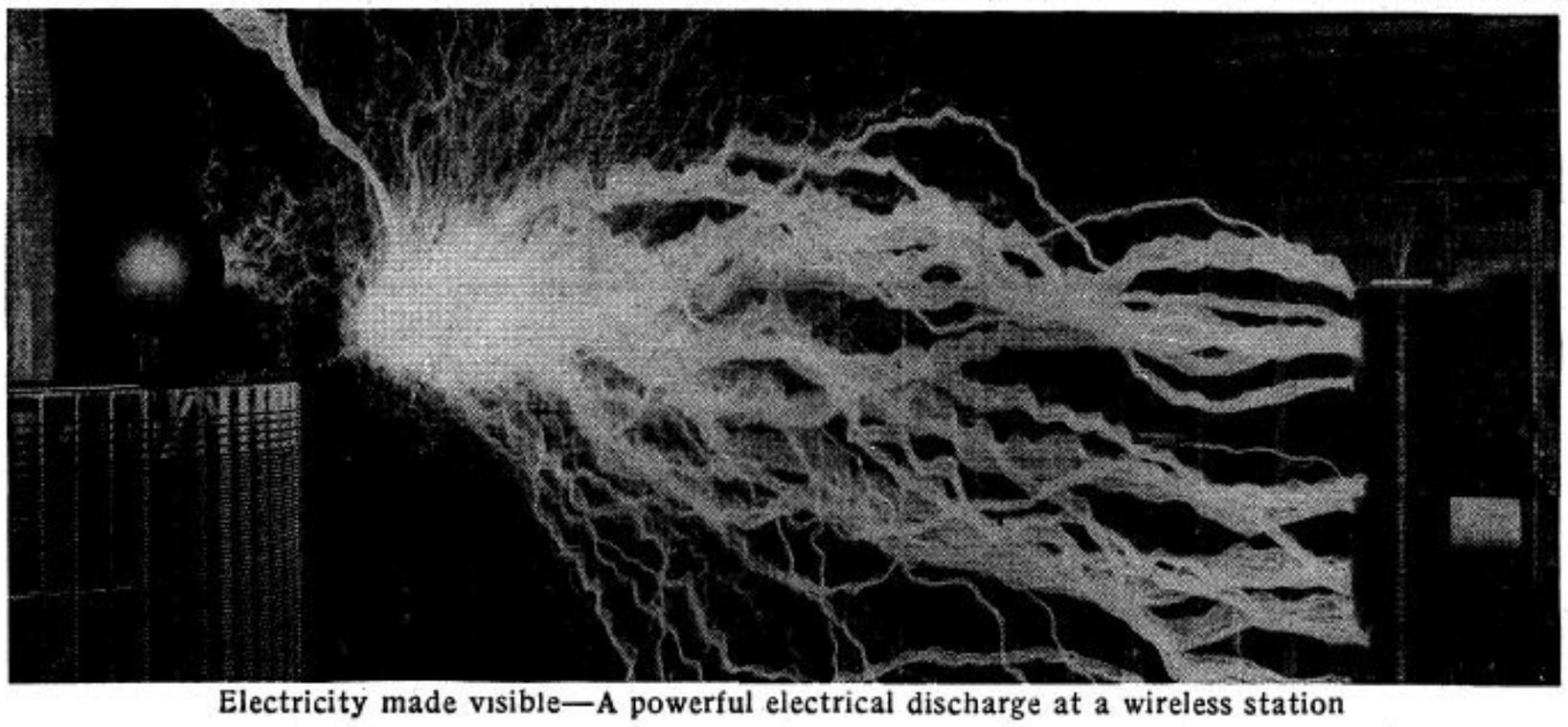


DRY CELL

Here we see three types of electric cells. The first is a simple form of electric cell, in which energy is produced by chemical action. A zinc plate and a carbon plate, connected by a wire, are standing in a jar of sulphuric acid. The acid eats into the zinc and liberates hydrogen, which drifts across the liquid to the carbon plate, as the upper arrow suggests. The ions of hydrogen travel from zinc to carbon, and start an electric current flowing in this direction, which causes swarms of electrons to crowd upon the connecting wire; these electrons continue to travel over the surface of the wire from the carbon to the zinc plate, and so set up a continual circulation of electricity just as long as the carbon and zinc are joined together. The hydrogen set free adheres to the carbon, and sets up an opposing force which soon puts the cell out of action, but in the Leclanché cell, where sal ammoniac takes the place of sulphuric acid, this trouble is overcome by a chemical mixture which removes the hydrogen. In the dry cell the zinc case takes the place of the zinc plate and the carbon is surrounded by manganese dioxide packed in a damp paste of sal ammoniac.



In a pocket torch a number of cells are connected to form a battery. These pictures show how it works. The wire connecting the two ends of the battery is represented by the filament in the lamp and by two metal strips, one attached to the zinc of the bottom cell, and the other to the metal cup into which the lamp is screwed. Until the gap between these two strips is bridged, however, there can be no circuit. In the left picture the switch is off, but as soon as it is brought down to the lower metal bolt, as seen in the right picture, the circuit is completed. Then the electrons flow from one cell to the next, along the metal strip, up to the bulb, and so on to the cells again. As the electrons flow along the delicate filament in the lamp, they cause the filament to become white hot and we have a bright light.



Electricity made visible—A powerful electrical discharge at a wireless station

THE ELECTRIC CURRENT

TOWARD the end of the eighteenth century new discoveries were made in electricity which brought about a wonderful change, and introduced an era that has entirely revolutionised the world.

Very little had been done with the static electricity produced by friction. But a *new* electricity was now discovered, the effects of which far transcended anything that could possibly be done with the electricity already known.

Two great names, those of Volta and Galvani, will be associated for all time with this discovery. We speak today of this new power as voltaic or galvanic electricity.

It may be imagined as a current flowing through a wire, and endowing the wire with a wonderful power that can be turned to account in a thousand ways.

In the year 1790, Luigi Galvani, an eminent doctor of Bologna, had skinned some frogs to make broth for his wife who was ill, and the leg of one of these frogs, being accidentally touched by a knife which had lain near an electric machine and had become charged with electricity, was seen to kick violently. Other frogs suspended from an iron railing by copper hooks were similarly made to give jerks each time they touched the railing. The mystery was explained by the discovery of current electricity, a form of electricity set up by the action of two dissimilar metals.

In 1800 Volta made the first electric battery by using two different metals, separated by some porous substance such as cloth moistened with water. By using a number of discs of tin, and silver or copper alternately, separated by moistened material, Volta produced what was afterwards termed Volta's Pile. The first description of his discovery was given in a letter written by Volta to the president of the Royal Society in London.

The secret of the battery had been discovered and was used as a means of producing quantities of electricity hitherto undreamed of.

A number of glasses containing acidulated water were used, with a zinc and copper strip dipping into each glass, the zinc of one pair connected to the copper of the next, and so on. In this way, Volta produced a " crown of cups," from which a current of what was then quite large power was obtained. Volta proved that the electricity he got from this chemical method was of exactly the same character as that which had previously been got from friction. Although he was a professor in the University of Pavia, Volta recognised that there were others who could advance the new science better than he could, and for the last twenty-five years of his

life he made no further attempts at electrical discoveries.

There is probably hardly a home today without its own battery, for this chemical generator of electricity is used for ringing electric bells, for lighting pocket lamps, and for many other purposes where only moderate power is required. There were afterwards discovered more powerful kinds of electric cells than the simple pieces of copper and zinc standing in acidulated water, though for many years something very similar was used for working the post office telegraphs.

THE REMARKABLE FORCE THAT FLOWS LIKE WATER FROM METAL TO METAL

Volta had found that when any two different metals are made to touch each other, one of them immediately assumes a different electric state from the other. If two different metals be put in a vessel filled with acid, one metal will always become electrified to a higher degree than the other. The word *potential* has been given to this state, and the secret of the battery is that if the two metals are connected by a wire, that is, by a conductor, an electric current will always flow from the metal at the higher potential to that at the lower potential.

One of the most powerful cells was invented by the famous chemist Bunsen. It consists of a cylinder of zinc standing in a jar filled with sulphuric acid. Inside the cylinder is placed a porous pot of unglazed earthenware through which gases can pass, containing a rod of carbon and filled with nitric acid. Three or four such cells joined up so as to form a *battery* would produce enough electricity to drive a sewing-machine motor, or light a six or eight candle-power lamp. A battery of twenty Bunsen cells would light an arc lamp. The electric battery, it will be seen, introduced the era of electric *power*, though little real use was ever made of it owing to the advent of the much more practical generator known as the dynamo.

THE FORCE THAT CAN BREAK UP COMPOUNDS INTO ELEMENTS

The real importance of the discovery of voltaic, or galvanic, electricity was that it gave a new force to man, with which he made a quick succession of other discoveries that laid the foundations of our vast knowledge of today. Even in the same year that Volta made his electric pile, two Englishmen, named Carlisle and Nicholson, discovered that the new current which it produced possessed the remarkable power of breaking down the bonds of Nature, and releasing hydrogen and oxygen from water.

A few years later Sir Humphry Davy found that the voltaic current would split up many other substances into their elements. The electric current could do what up till then fire alone had done, and far more. Science had entered a new era.

Then, in 1820, came perhaps the greatest of all electrical discoveries in so far as it paved the way for the dynamo, the motor, the telephone, the telegraph, and all the wonders of the electric world of today. Hans Christian Oersted, a Danish scientist world-famed for his lucid writings, found that if a current from a voltaic battery was made to flow through a wire some new and mysterious force was created around the wire which caused a compass needle to turn around.

It had long been thought that some connection must exist between the forces of magnetism and electricity. It was left to Oersted in Copenhagen to show that the two powers were actually related, and in what way.

NOTHING IN NATURE CAN BE HAD FOR NOTHING

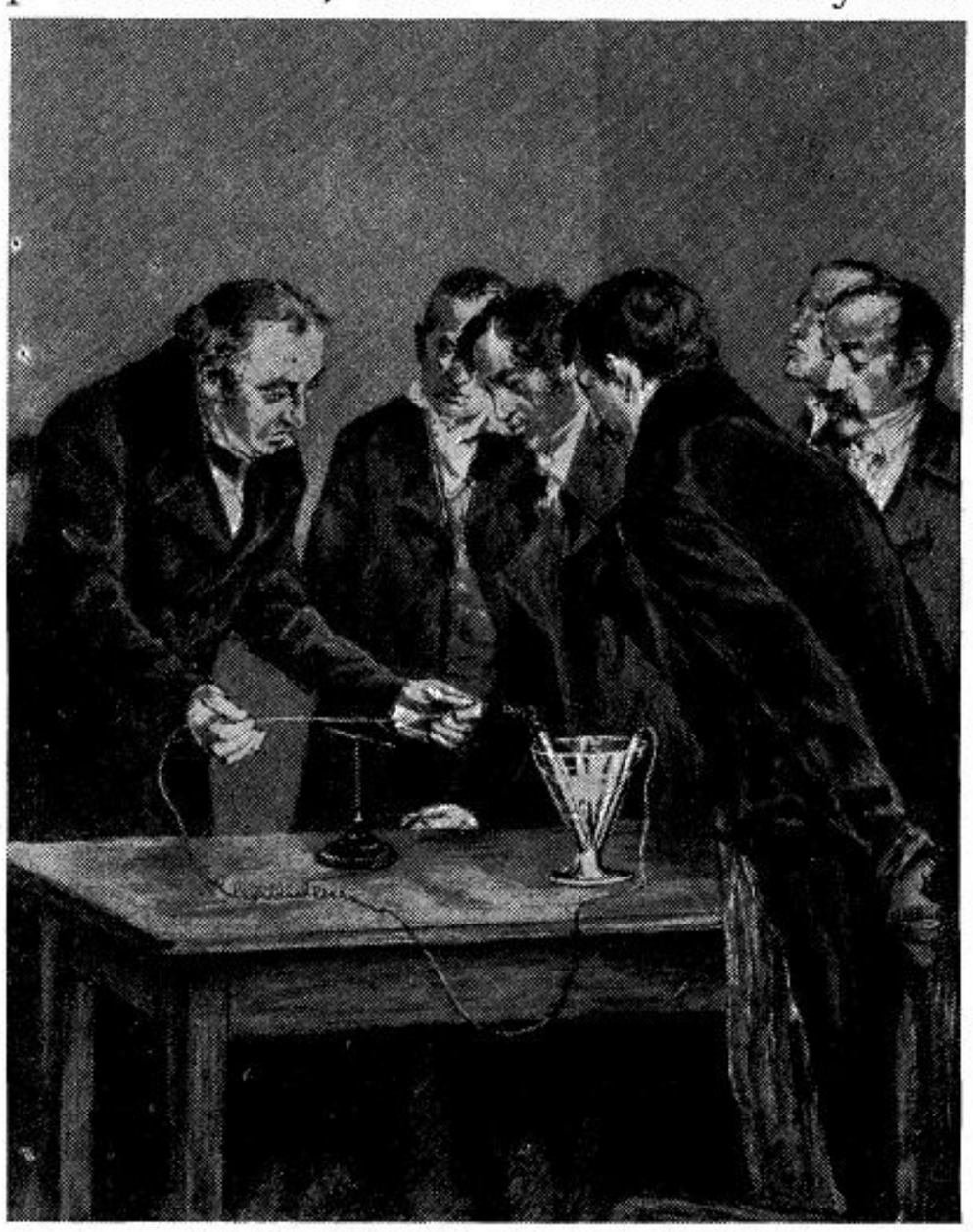
If you wind a spiral cord of copper wire round a pencil, and connect the two ends of the coil to the two " poles " of a battery, the passage of the electric current through the coil makes it a magnet. The coil possesses magnetic power, and one end of it will act like the North pole of a magnet, the other end like a South pole. As long as current flows through the coil, it remains an electric magnet. Place a rod of iron through the coil, and the iron becomes powerfully magnetised.

A magnet of this kind no bigger than a horse-shoe, excited by the current from a couple of Bunsen cells, becomes strong enough to lift an iron scuttle filled with coal. The chemical waste going on in the battery is turned into *force*.

It is the experience all through Nature that nothing can be gained without cost, and in the electric battery the same holds good—a battery will not go on for ever producing current. A destructive action is, indeed, going on. The battery is a little world in itself, in which all kinds of interesting things are happening. A good example is found in the Daniell's cell, for years used in telegraphy because of its

constancy. Here we find a copper plate or cylinder standing in a solution of a blue salt called sulphate of copper, and inside the porous pot is a zinc rod standing in a solution of sulphate of zinc or weak sulphuric acid. As soon as the copper and zinc plates are joined by a wire, or connected up with an electric instrument through which a current flows, everything within the battery gets busy.

In order to understand what happens we must try to imagine what the mysterious *ion* is. Chemistry tells us that all substances are made up of molecules, each molecule being the simplest arrangement of the atoms that can exist in a free state. A molecule of salt consists of one atom of sodium and one atom of chlorine. But, if an electric current were passed through water in which salt has been dissolved, these molecules would be gradually split up into ions of sodium and chlorine, each ion of sodium bearing a charge of positive electricity; each ion of chlorine bearing a charge of negative electricity. The sodium ions would gradually travel through the water towards the negative pole, an equal number of chlorine ions would travel towards the positive pole, and this process would go on steadily until all the salt had been used up.



OERSTED TRIES AN EXPERIMENT

We have already seen how over a hundred years ago it was discovered that electricity broke up water into hydrogen and oxygen in a similar way.

This marching along of the ions takes place in every battery in one way or another. To return to the Daniell's cell, the zinc rod gradually becomes used up through ions of zinc being set free, and these travel towards the side of the porous pot. In the outer vessel, the sulphate of copper is being turned into ions of copper and what we may call ions of sulphate. The copper ions travel to the copper plate, and instantly they meet it they become transformed from invisible atoms to solid copper metal, and they actually build up and increase the weight of the copper plate. The ions of sulphate travel in the opposite direction, and make their way to the porous pot. Here they meet the zinc ions, at once join forces with them, and produce more zinc sulphate.

This busy little world of travelling ions is present in every battery. Every time you press the switch of a pocket-lamp the little battery that supplies the lighting current begins producing ions of ammonium and chlorine, which in turn set up new chemical processes that gradually exhaust its power. This is why a battery will only give so many flashes, and has then to be renewed.

One of the best batteries for boys to experiment with is known as the *bichromate* pattern. In its usual form a zinc plate and two carbon plates, one on either side, are immersed in a solution of bichromate of potash acidulated with sulphuric acid. A powerful current is generated sufficiently strong to drive a toy motor or to operate a small two-volt electric lamp.

Perhaps the most useful and most widely employed battery is the Leclanché. This is used for working electric bells and pocket flash-lamps, and is the type employed for the little high tension batteries used in wireless receiving sets.

The negative element of this battery is a zinc rod, or often a zinc box, forming the container of the cell; the positive element is a carbon rod enclosed in a porous pot—or a little canvas or linen bag—filled with black oxide of manganese. A liquid is used containing a salt sold by every ironmonger, and known as sal ammoniac—in chemical language, chloride of ammonium. In what

is called a dry battery, the sal ammoniac is made into a paste with sawdust, so that there is no liquid to spill, but it is not really dry, as without the presence of a liquid there would be no fluid in which the ions could travel.

While the cell is in use, hydrogen gas is often set free at the negative element, in the form of tiny bubbles which cling to the metal and form a protective coating that keeps the fluid away from it. When this happens the chemical action can no longer go on, and the cell is said to be polarised. Given a short rest, the bubbles of gas disappear, and the metal is once more in contact with the fluid of the cell, which will work again. Batteries thus require frequent rests, and cannot be worked continuously for too long a period.

Let us now come back for a moment to the early part of the last century, when the powers of an electric battery were first being revealed. The next illustrious name after Oersted is that of Ampère, a famous physicist of France, who made very great advances in electrical knowledge, and whose name will be used for all time as the unit of current flowing through a wire.

THE TWO GREAT FACTS OF ELECTRICAL RESISTANCE AND ELECTRICAL HEAT

It became possible to measure the strength of an electric current by the magnetic power which it could produce, and instruments were invented by which these currents could be measured; and, just as a piece of iron placed near a magnet is itself made into a magnet, so it was found that on passing a voltaic current through a coil of wire a current could be set up in another coil of wire placed near to it.

Two great facts had also been discovered: one, that certain metals offered greater resistance to the flow of a current through them than others; another, that the passage of an electric current through a wire made it hot. Ohm discovered that the amount of current which can flow through a conductor depends strictly on the *resistance* of the conductor, and ever afterwards this property of resistance was measured in units called ohms, after his name.

The fact that materials with a great resistance cause an electric current to generate heat has proved of the greatest importance, and today we are able to heat a house, a cooking-stove, or a furnace by passing electricity through materials which offer great resistance. The day will come when coal and gas are no longer used for heating; the coal will be used to make steam, the steam-engine will drive a machine which generates electricity, and the electric current will be turned into heat by making it flow through metallic wires which offer great resistance, and, in consequence, generate great heat. This is already done, of course, on quite a large scale; but it will be the general rule at a time not far distant, for science has triumphed over the present wasteful methods of turning fuel into power.

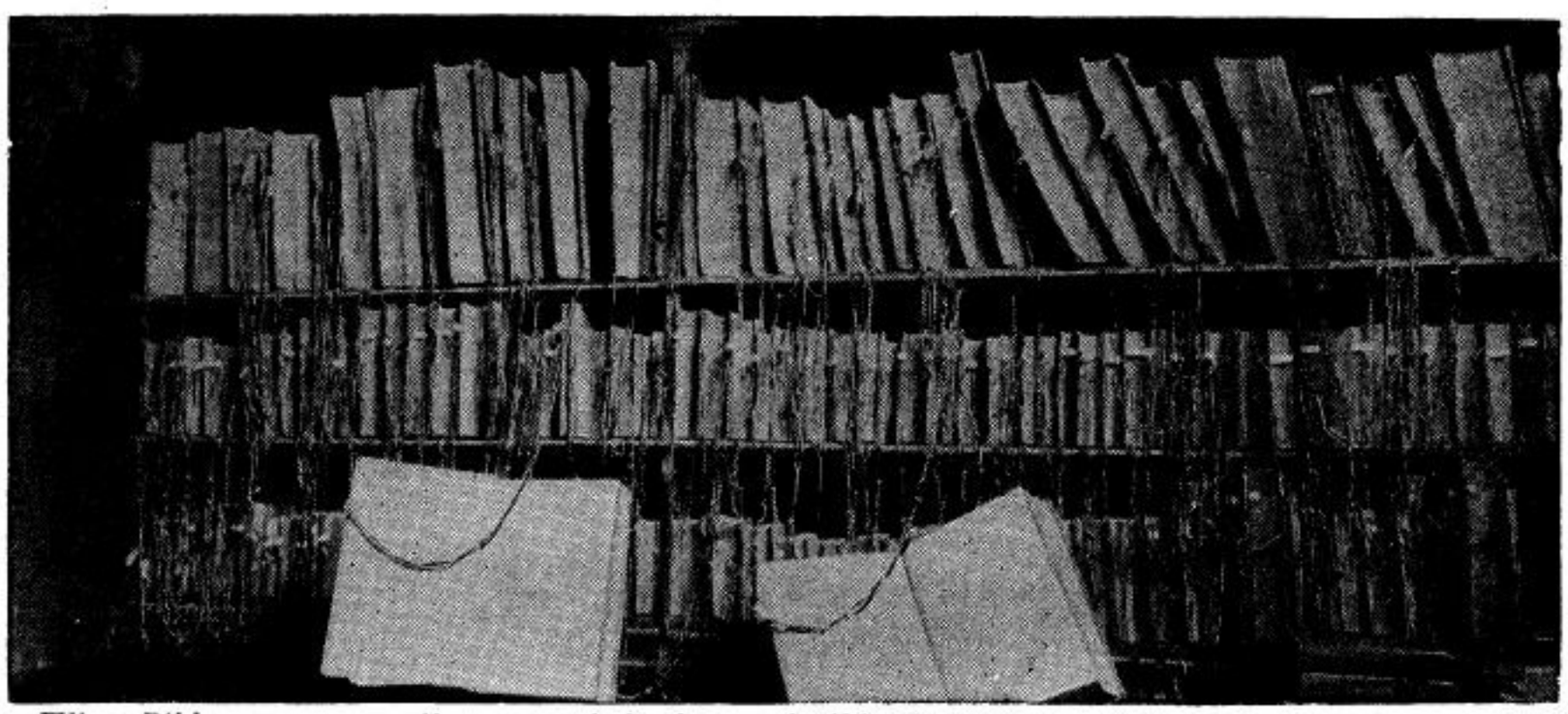
THE MYSTERIOUS FORCE CONTROLLED, STARTED, AND STOPPED

The effect of an electric current upon a magnet had led the way to the first means of measuring the strength of this new power that was to rule the world, and men of every nation set to work to make electricity an exact science. But for very many years its real nature was not to be understood, and electricity was looked upon as a mysterious fluid which flowed in, or perhaps, around the wires that conducted it.

The interest of the whole world had, at any rate, been roused, for here was a power which, produced by the action of dissimilar metals excited by a chemical liquid, could make light and heat, create magnetic power, and decompose matter and other substances into the elements of which they were made. The new power could be controlled, started and stopped; it could be led to any spot by means of conductors, and be made to do work there. Greatest of all, it was shown not only how electricity could produce magnetic power, but how magnetic power could in its turn produce electricity, and from these early observations was evolved the dynamo, the machine which today enables us to generate all the electricity we want from the mechanical power of the steam-engine, the oil-engine, and the waterfall.

THE POWER THAT CAN BE SENT THOUSANDS OF MILES

Without its magnetic effects, the voltaic battery would have been very limited in its uses, though it might have been developed on wonderful lines. But this remarkable connection between the two forces, separately revealed to man thousands of years ago, has brought about the harnessing of power, and the means of turning power into a force that can be led if necessary hundreds of miles to some distant spot, there to be used again.



When Bibles were scarce they were chained up as in this picture of a library at Hereford Cathedral

THE GREATEST ENGLISH BOOK

No book, considered as literature, has had so great an influence on the English people as the Bible.

No other book has done so much toward moulding the English language. Though in origin it is not an English book at all, it is the greatest book in the English tongue, the one best known and best deserving to be known as a literary work.

Of course, because of the subjects it brings before its readers it is a supremely great book in any language, but we are not here referring to its religious teaching. It is the influence of its style on British speech and writing that concerns us for the moment.

For more than 500 years the Bible has been popular in England beyond all other books, more read, more listened to, more known than any other writing. For more than 300 years it has set the standard and been the great example of English prose, with effects on our speech that cannot be overestimated in value.

From the earliest days of Christian England there seems to have been a desire to read the Bible. Bede's eagerness in translating the gospel of Saint John on his death-bed and Alfred's unfinished translation of the Psalms are illustrations, but of course these beginnings have no bearing on the Bible as English literature, for the language used was not English as we know it, but Anglo-Saxon, unreadable by us except as a strange tongue.

The first translation that counts was Wycliffe's, who was a contemporary of Chaucer, and whose version, not from the original tongues, but from the Latin, though rough and ready, and never printed till quite recent times, had a lasting influence during the next 150 years, till William Tyndale produced his beautiful version direct from the original languages, Hebrew and Greek.

Eighty years after Tyndale had paid with his life for his noble ambition that " every boy that driveth the plough should know the scriptures," the noble Authorised Version was produced from the various versions that had gone before, but chiefly from Tyndale's, and " England became the people of a book and that book the Bible."

What is it in this wonderful book that has given it such a great and lasting influence on our literature, an influence far more powerful than any it has had on other languages ?

An important fact is that Hebrew, the language of the Old Testament, is very simple, with clear imagery readily understood and conveying its meaning in plain

words that represent common objects, even when the thought is most poetical and beautiful. "The Lord is my Shepherd, I shall not want." What could be simpler, or more tender and consoling? "A thousand years in Thy sight are but as yesterday when it is past, and as a watch in the night." What could be grander and more impressive?

HOW OUR ENGLISH VERSION PRESERVES THE OLD BEAUTY OF THE BIBLE

And these definite images and thoughts by comparison were changed into as simple English words at the very time when the English language was being formed, and they fitted in with it so perfectly that in modern days most of the translations of the Bible into 500 languages and dialects have been made, not from Hebrew and Greek, but from the English version which preserves, with a wonderful fidelity, the combined simplicity and grandeur of the language orginally used.

That England's earliest printed language widely circulated among her people should have been so plain and clear and pure as it is in the Bible has been a continuing blessing that will never be lost. Really it is not what might have been expected. And it is not what was happening in many other directions in the formation of our noble English prose.

It must be remembered that learning was largely restricted to the clergy in those early days; that they often lived a secluded life; that Latin was their chief study; and the natural tendency in writing was to parade any knowledge which most of the people did not have. And so writing in prose was likely to be learned, cumbrous, and over the heads of unlearned persons. That is what happened then, and does happen to this day.

THE BOOK OF NATURAL MUSIC AND ITS MIGHTY INFLUENCE

Any special set of men with exclusive knowledge are inclined to create a formal language for themselves that does not readily give up its meaning to plain people. It is so with philosophy, religion, the law, medicine, education, and most of all with science. There is a pretence that these dignified subjects cannot be discussed in plain speech, and so a special jargon is invented for each learned clique, and in no instance does the jargon become literature. The dialects of special learning have to be shed before any piece of prose can be read with pleasure for its own sake. How fortunate it was then that, from the first, there was a book in the language of the people, plain, strong, full, with a natural music in it, and that book one with an extraordinary variety of expression, rich in interest, and exhaustless in meaning. Theology swiftly hid its meaning in a clumsy jargon from which it has never escaped, but the Bible is clear, simple, and beautiful.

And this purity in language and style, drawn from common English speech, and constantly reflected back from the Bible to refine our tongue afresh, has been influencing sincere writers ever since.

The most popular books have always been written in words akin to those of the Bible, and so literature is refreshed from the wells of common speech. It has been said with truth that though the Bible language was that in common use, it is impossible to be vulgar with it, for it is everyday language refined by choiceness and dignity.

THE RAREST STORIES IN THE BOOKS OF THE WORLD

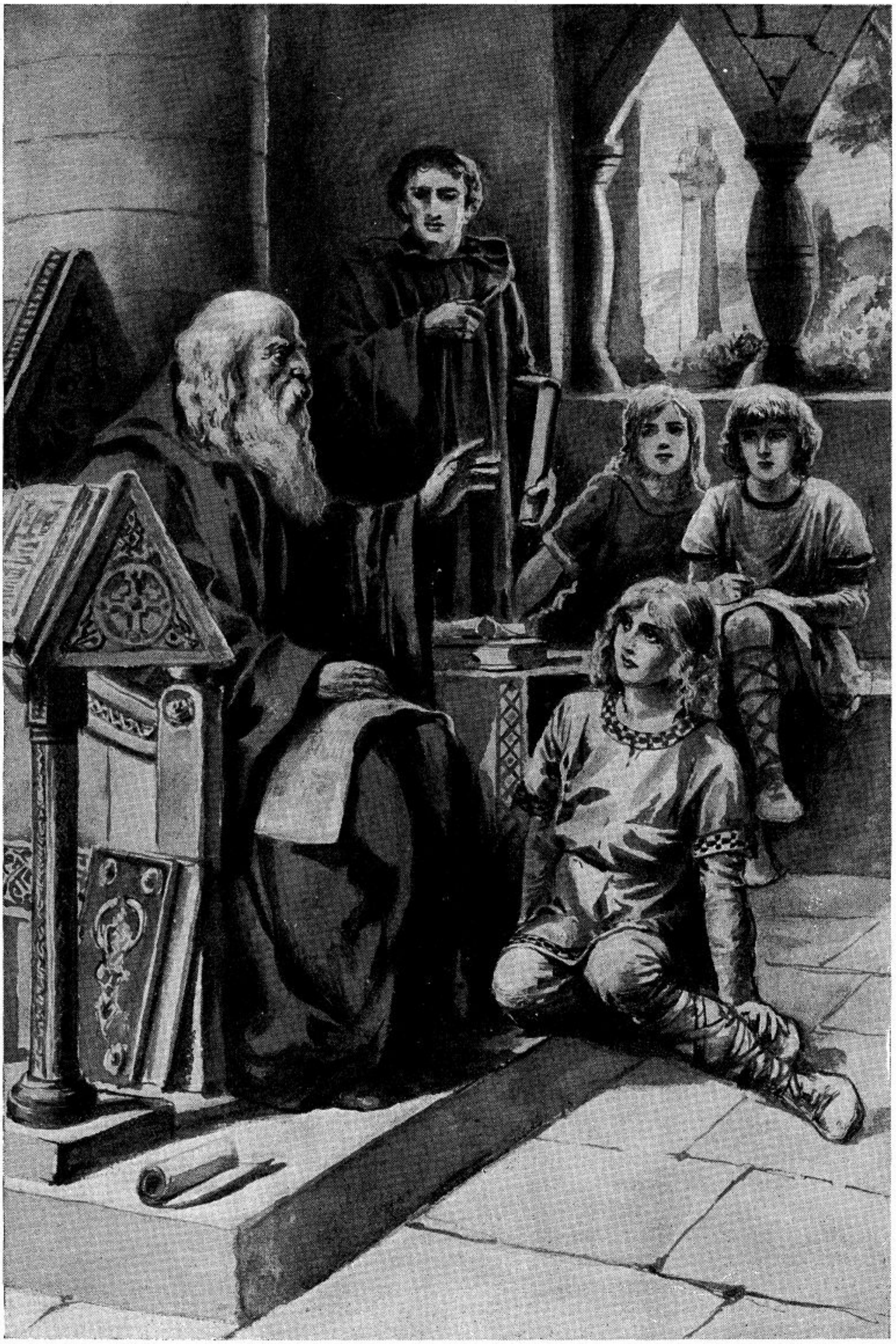
Nor is there lack of breadth and variety in the contents of the Bible. The most vigorous of minds will not be narrowed, but will be expanded by its use. Properly studied, the Bible provides a generous education from a literary point of view. It covers a wide range of history touching all the great nations of antiquity, and there is no form of human expression that it does not illustrate.

No book in existence illustrates so well the writing of history, for it is a library of books combined into one. The separate parts now brought together as a volume were written and edited by hundreds of authors working through at least a thousand years, and using historical records and orally conveyed memories that reach back several thousand years.

It contains examples of every form of writing and speech. There are bare lists of family names showing how ancestry was treasured in the East, when memory was the only recorder. There are the legends of national origin, like those of every other race besides the Jewish that has emerged from a wandering life into a settled civilisation.

Then, early and late, there are the choicest examples of narrative—the telling of a story, simple, graphic and beautiful—

THE NOBLE BEDE WITH HIS SCHOOLBOYS



BEDE, TRANSLATOR OF THE BIBLE 1200 YEARS AGO, TEACHING HIS BOYS IN THE SCHOOL AT JARROW

that the literatures of the world afford. Whether one is following the exquisitely told story of Joseph in Egypt forgiving his brethren, or the wanderings and talks of our Lord, or the stormy life of Paul, the telling of the story is equally perfect in its simplicity, and its feeling of reality.

Of formal writing of history there are abundant illustrations, which, when they are closely examined, disclose how in ancient Palestine as in modern Europe the telling of the tale of the past depends quite as much on the point of view of the historian as on what actually happened. Then as now, one must know to which side the historian belonged.

Of controversy in politics and religion here is a fairly continuous, but rather confused, record in the works of the prophets, who were the journalists of their day—the first men in Israel to use deliberately the power of the pen in public affairs, as well as warning oratory. But how earnest those ancient politicians and preachers were, how terrible in their warnings, how eloquent in their outbursts of golden hope!

Of oratory there is no lack through the story of two thousand years, down to its most formal example in the pleadings for justice by Paul, the eloquent and fearless.

Poetry is scattered lavishly through the long range of books from Genesis to Revelations, beginning with the majestic vision of the creation of all things and ending with the vision of eternal day where the Lord God giveth an uncreated light.

Not only is there the poetry of sublime imagination, but also that of song, adapted to a wide variety of circumstances—odes of victory, tender laments, outbursts of pious adoration, and magnificent Nature poems saturated with the feeling of God in all that is lovely or grand or beneficent.

Then, too, there is sublime drama, as in the book of Job, and allegory in the Book of Jonah rebuking the hard exclusiveness of the fanatical Jews, who would allow no other people to have access to God.

And lastly, oldest of all the writings in the New Testament, there are letters in many styles—some familiar notes about everyday things, some good advice, some closely-reasoned argument, some lofty expositions of the mysteries of death. What a vast field of literature is here, vast in time, in subject, in method of writing, in complexity of authorship, but one in feeling to a very large extent.

A TWELFTH-CENTURY PICTURE OF BEDE WRITING

And all this, though the product of many minds, of other races, and reaching us by translation by many minds, is in effect an English book, the greatest and most distinctive English book, accepted and belonging in its entirety to the British race more than to the Jewish race from whom it came. And so it is that in thinking of English literature, and how prose writing came to be what it is, we are obliged to give not only an early place, but a commanding place to the Authorised Version of the Bible in English. Shaped by study and piety, it is the book which beyond all others forms the kernel of our speech and literature, our greatest national classic, the delight alike of the scholar and of the unlearned. It finds expression for us in our most solemn moments and invites us to the noblest heights of thought.

In the world's treasure-house of literatures the share of space for the English tongue is generous; but in all that wide compartment the rarest gem is the translation of the Hebrew Bible and the Christian New Testament given to us by 47 studious men, not one of whom wrote anything remarkable on his own account.

THE LOVELY BOOKS OF LONG AGO

The glorious books the old monks designed and copied by hand in the days before printing make us feel how poor our books are now, says our Art Contributor on page 450. Here we give a few pages from old books that have come down to us through time, and are still to be seen in the British Museum.

A GLORIOUS PAGE FROM A BOOK MADE BY A MONK ABOUT 600 YEARS AGO

A RIDER ON A WHITE HORSE GOES FORTH CONQUERING AND TO CONQUER

FROM A BOOK MADE BY THREE ENGLISH ARTISTS 600 YEARS AGO

A PAGE FROM A HOLY BOOK BELONGING TO A LADY OF THE HOUSE OF SALUCES. IN FRANCE, IN THE MIDDLE OF THE FIFTEENTH CENTURY

These pictures are from Bibles illustrated by English artists between the years 1250 and 1400

From a book 600 years old

From a Book made about the year 1300

Six centuries old

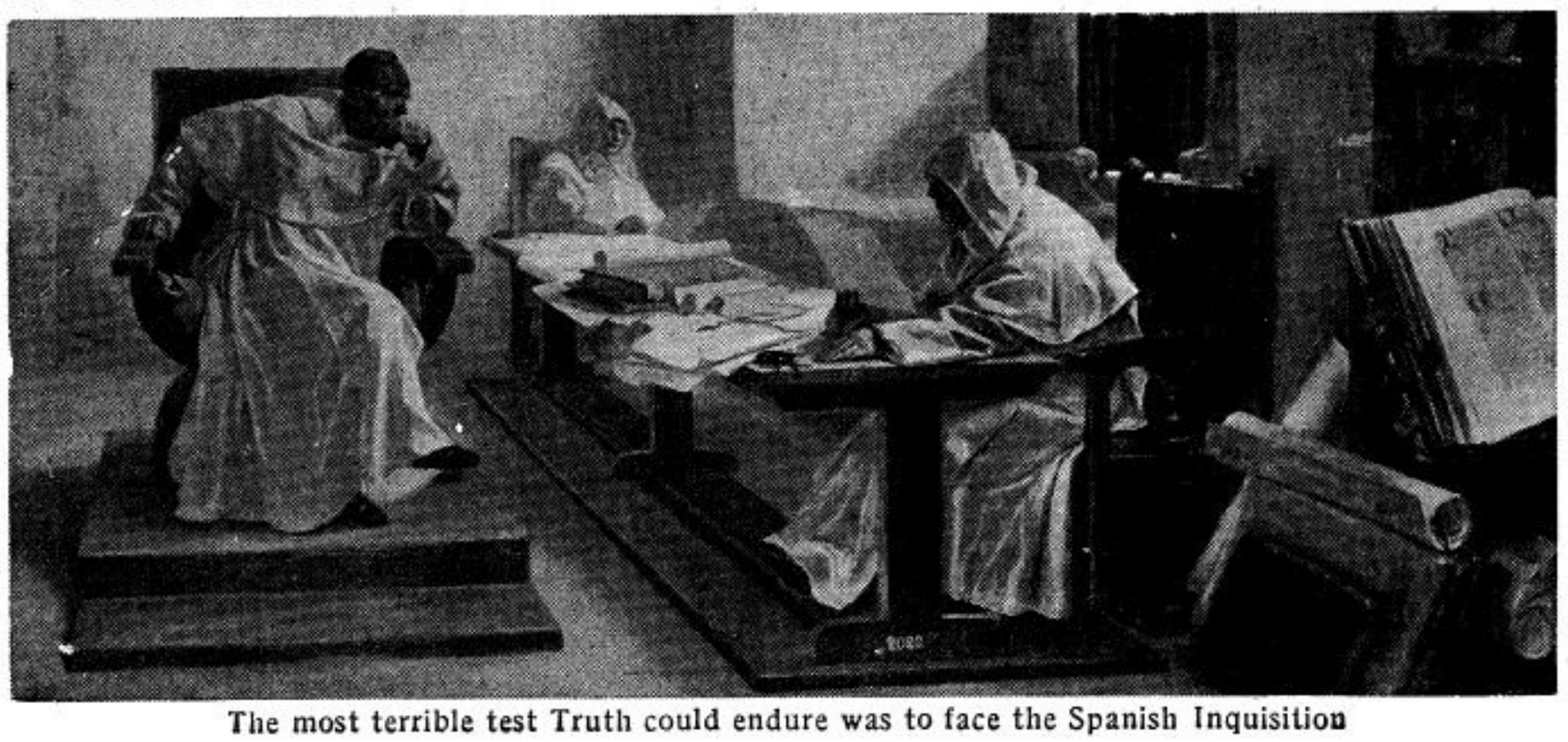
From a Book of Psalms made 600 years ago for an abbey of nuns

From a Book of Psalms of about the year 1270

15th century Picture of Abraham

Initials from an English-made Bible 650 years ago

The Great Words that Stir the Hearts and Minds of All Mankind



The most terrible test Truth could endure was to face the Spanish Inquisition

TRUTH

It fortifies my soul to know
That, though I perish, Truth is so:
That, howsoe'er I stray and range,
Whate'er I do, Thou dost not change.
I steadier step when I recall
That if I slip Thou dost not fall.

ALL down the ages men have forsaken their homes to seek treasure islands and to find things no one has found before. Adventure is in our blood.

We can never rest content for a long time with the familiar and the customary. Perhaps you have heard your mother say: "I am tired of this wall-paper, and these curtains; we will have something new in the spring." She is moved by the same spirit which sent the brave Magellan, the two Cabots, Sir Francis Drake, Sir Walter Raleigh, and Captain Scott to perilous seas forlorn.

But one of the wisest men who ever lived saw in this passion for the new, the inexperienced, the unknown, something far deeper and far grander than a mere thirst for physical adventures. He saw in it that movement of man's spirit which has carried him from savagery, darkness, and ignorance to civilisation, light, and the power which is born of knowledge. In other words, this wise Frenchman, Montaigne, saw in adventure the hidden force of progress and evolution, the energy which makes the wheels go round, the power without which the universe would be stagnant and dead. We are born, he said, to inquire after truth.

That is a great saying. We should keep it constantly before our minds. We should make it so completely a part of our inmost life that we always think of ourselves as the adventurers of truth—every day a new search, every night a new record.

But Montaigne teaches us another lesson. We are, indeed, born to inquire after truth, but "it belongs to a greater Power to possess it." He died 24 years before our Shakespeare died. He did not say that truth was hidden in a well. He said it was in the heights of the Divine. Truth is God, and in seeking truth we are seeking our Creator.

Now, think what a wonderful thing human life is, what an exciting and delightful thing! *We are born to seek what we can never find!*

It is the greatest game of hide and seek that was ever invented. God has hidden his truth, and we shall never find it on this Earth; but He has made the search for it so exciting and splendid that, although we know we can never discover it, the greatest of the sons of men have found their highest happiness in this search. To this every age bears witness. Do you remember those striking words of

a great German writer of the eighteenth century? Lessing said:

If God held in His right hand all truth, and in His left the everlasting desire for truth, although with the condition that I should remain in error for ever—and if He said to me, Choose, I should humbly bow before His left hand, and say, "Father, give; pure truth is for Thee alone."

He said that the worth of a man does not lie in what he knows, but in the earnest efforts he has made to know it—"for it is not through the possession of truth, but through the search for truth, that he develops those powers in which alone consists his ever-growing perfection."

There is this to be remembered, that in seeking after pure truth, although we can never find it here on Earth, we do collect certain and definite grains of truth. All our power over nature comes from this living collection of infinitesimal fragments of truth. For example, men once believed the world was flat and immovable, and because of this wrong notion they could not understand the movements of the stars. But as soon as they discovered that the Earth is a sphere, that it rotates on its axis, and that it swings round the Sun, they were able to begin those marvellous flights into the heavens, those august adventures among the stars, which have given us the marvellous science of astronomy.

THE TRUTH THAT MAY BE HID FROM US FOR THOUSANDS OF YEARS

That is perhaps the most wonderful thing about the search for Truth. Though we never grasp her "flying robe and fluttering hem," yet ever, as we pursue, we are led from height to height and from star to star, obtaining wider views of both the physical and moral universe.

We do not know the truth of Evil. That is a problem which may be hid from us for thousands of years, perhaps never solved on Earth. But at least we know that Good is finer than Evil. We know as certainly as we know anything that a merciful man is higher in the scale of being than a cruel man. We do not doubt for a moment that a drunkard is far lower in the scale of being than a sober man who is unselfish and refined. These things we call truths, and we guide our lives by them.

But many great thinkers find their happiness in attending to this tremendous problem of evil. They do not think they will ever understand it, but because it is such a terrific puzzle they love to try to understand a part of it, or at any rate something about it. One man says that there is no such thing as evil—that it is merely the absence of good, as darkness is the absence of light. So they argue together, and in their argument they find little bits of truth which help us to think rightly and to make juster laws.

SIR ISAAC NEWTON'S APPLE AND EINSTEIN'S CURVE

The great Greek Eucleides, whom we call Euclid, laid down several laws in mathematics which were regarded as self-evident truths. For two thousand years they have been unquestioned, and on the basis of those truths many wonderful engineering feats have been performed. But now we begin to see that some of those truths are false, and although for practical purposes his errors still serve for truth, in the region of pure thought we are compelled to begin our search for truth all over again.

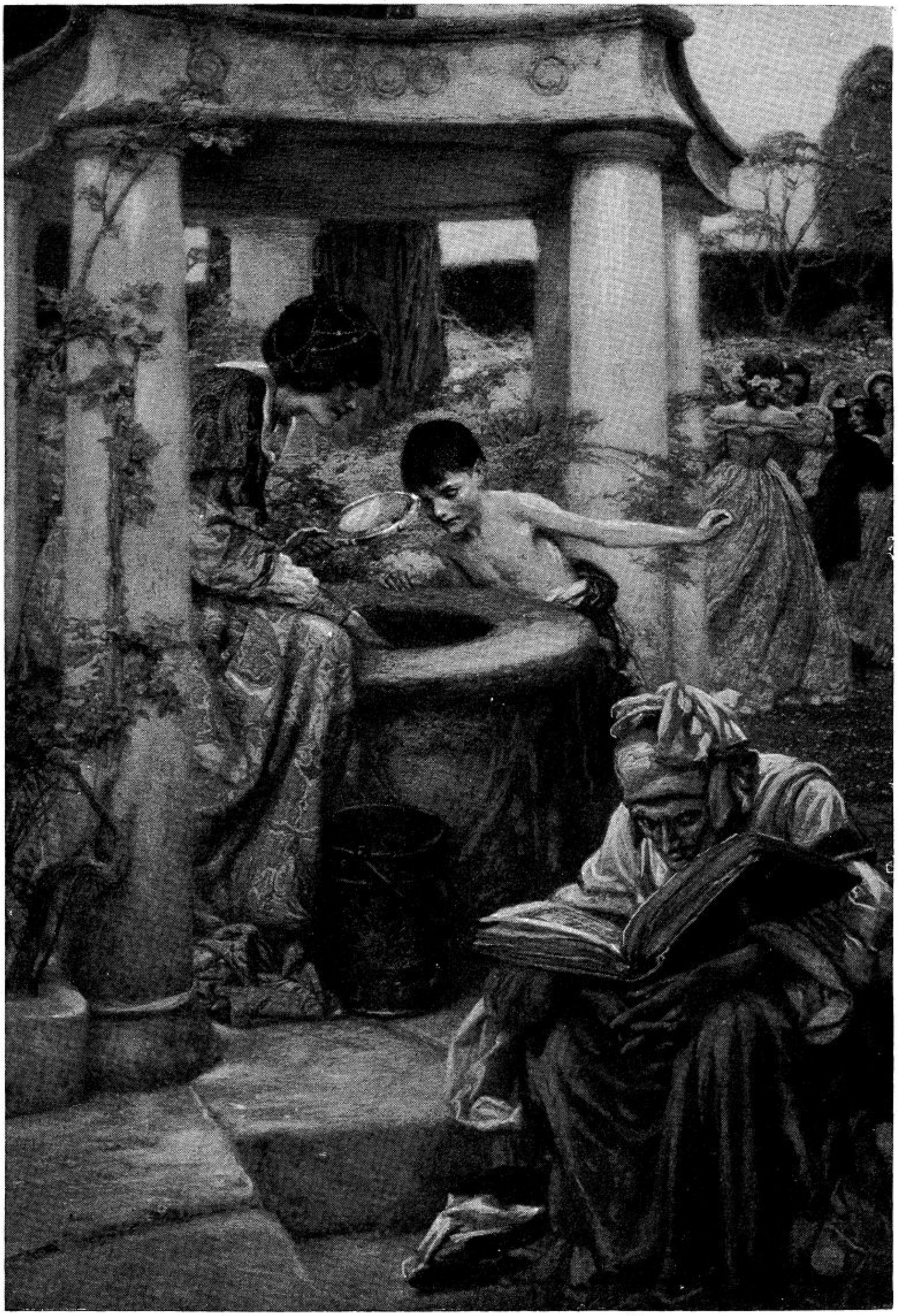
Sir Isaac Newton saw an apple fall to the ground. What made it fall down? Why did it not fall up? He came to the conclusion that the Earth *pulled* the apple towards it, and this pulling of the Earth he called gravitation. Until the other day no one doubted this truth. It was regarded, like Euclid's definitions, as self-evident. But now Einstein tells us that it is *a curve in space* which brings all things into order, just as marbles run to the centre of an uneven floor. Who is right—Newton or Einstein? So we have to begin our thinking over again. The truth is still hidden.

You will see from these examples that truth must always remain *relative*—that is to say, different in various circumstances. An old trick shows us what is meant by *relative truth*. People used to say, "Which is taller, a silk hat or the wainscot round this parlour?" Nearly everyone answered, "The hat." The joke lay in the absurdly dwarf-like appearance of the tall hat when it was placed on the floor beside the wainscot. The wainscot, which looked so short, appeared tall, and the hat, which seemed so tall, appeared little taller than a mushroom.

A MOST USEFUL FOUNDATION FOR ALL OUR THINKING

You see a man running down the road, and you say, "How fast he is moving!" That is quite true. But a horse gallops by, and the man seems to be walking; then a motor-car dashes up, and he appears to

TRUTH AT THE BOTTOM OF A WELL



TRUTH, IT IS SAID, IS AT THE BOTTOM OF A WELL—HERE MR. ARTHUR DIXON PUTS THE IDEA IN A CHARMING PICTURE

be crawling; and then a swallow flashes past him, and the man actually appears to be standing still.

This fact of the relativity of truth is a most useful foundation for all your thinking. Suppose somebody brought you a very bad and ugly picture, and said to you: "This is a most beautiful picture, and you must admire it"; what would you say? It would be foolish merely to assert that in your opinion it was a bad picture. The man might be stronger than you, and he might say, "I will fight you to prove I am right." That is how all the wars of the world have been made; as if force could prove what is true! No; your true answer would be to hang the ugly picture beside a picture which all the intelligent people of the world declare to be beautiful, and to make its champion compare his idea of beauty with this other idea of beauty.

THE NEED FOR A STANDARD BY WHICH WE CAN MEASURE FINE THINGS

We call this way of arriving at truth, *judging by standards*. It is the best way we know for protecting ourselves against the dangers of wrong thinking.

One of the chief values of education lies in this, that it forms in our minds certain definite standards for judging new things. If a boy came to you with a blunt knife and recommended it as a pencil-sharpener, you could prove to him he was wrong by showing him what a sharp knife can do. In the same way, if you have read the poetry of Shakespeare and Keats, you will not rave about a modern ballad as if it was the highest kind of poetry, however fresh and interesting it may be. And if you have read history, you will not be alarmed by every new crisis announced in the newspapers as the end of the world.

CIVILISATION WOULD FALL TO PIECES IF EVERYBODY DID AS HE LIKED

Without these standards in the mind we cannot properly and safely judge of truth; they are the measures by which we test the claims of fresh ideas. That is why education steadies the mind, and enables it to form just opinions. The more we know about history and science and literature and art, the less likely are we to become anarchists, quacks, faddists, and eccentrics.

So we have our moral standards. People sometimes break away from the normal behaviour of civilised nations and try to attract attention to themselves by being noisy, or irreverent, or challenging. Others say, "How original!" and follow their example. If you argue with them, they will laugh at you, and perhaps they will call you a prig or a kill-joy. You can never argue them out of their badness. They are not judging by your standards. You judge them by the useful, beautiful and unselfish lives of people like St. Francis, John Howard, Elizabeth Fry, Florence Nightingale, the good Lord Shaftesbury, and Dr. Barnardo. By such standards their lives are seen at once to be contemptible. But these people say, "We have no standards, except our own will and pleasure!" and they become anarchists of the moral life.

Human existence could not continue in a civilised condition if every individual in a community acted in this way. You will see how important truth is if you imagine life in England without these standards. Suppose bankers and solicitors denied the claims of honesty; suppose doctors came to their patients in a drunken condition; suppose the drivers of express trains took no notice of signals; and suppose policemen lived like burglars and assassins. Civilisation would fall to pieces if everybody did as he liked, and if there was no general acknowledgment among men that certain things are right and certain things are wrong.

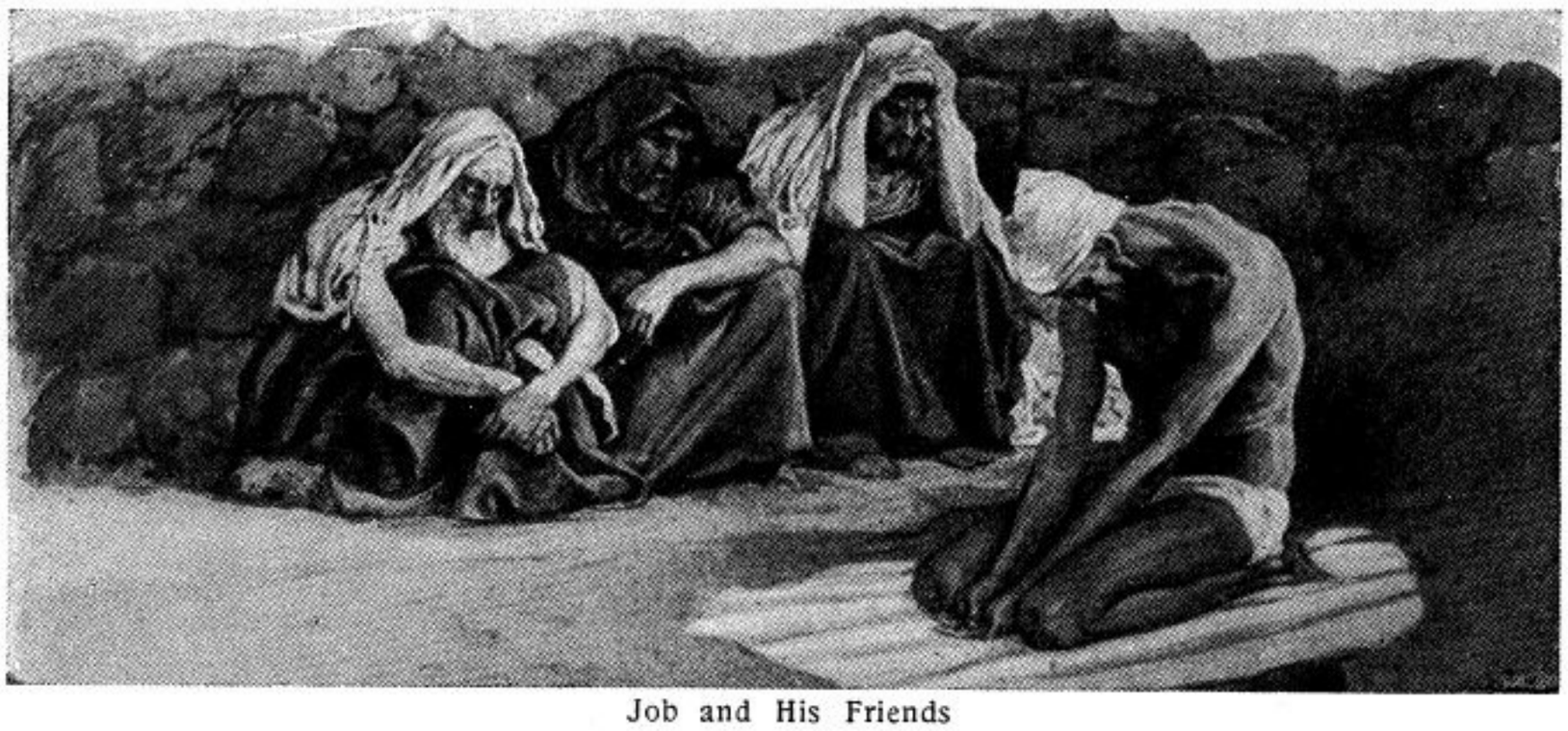
THE SAFETY OF OUR LIVES DEPENDS ON LOYALTY TO TRUTH

The safety of civilisation depends on loyalty to the moral law, and the moral law is the result of man's adventure in the the fields of truth. We are born to inquire after truth—not only physical truth, not only the truth of our bodies, of the Earth, of the winds, of the tides, of the stars—but the truth of our own souls. What is best for a man? What is the conduct which helps us most, and what is the conduct which hinders or destroys us?

We can never know the absolute truth, but we can know and do know that love of knowledge, love of goodness, and love of truth—these three great affections of the human spirit lead us away from error, and guide our feet into the way of happiness and dominion.

There may be fools and fools, wise men and wise men—everything is relative; but between folly and wisdom, between false and true, between knowledge and ignorance, there is a great gulf, and we are standing, each one of us, either on the one side or the other of that tremendous chasm.

The Story of the Most Beautiful Book in the World



Job and His Friends

THE FIRST DAYS OF EVIL

THE Ark rested in a place where it was easy for the sons of Noah to spread themselves over the Earth. God wanted men to cultivate the Earth, and so He brought the Ark to anchor where they could most easily cross into all lands. But the sons of Noah settled down in one place and built a great city, and in the midst of the city they erected a vast tower.

Then, says the Bible, when God saw that they were determined to disobey Him, He caused the people to speak in different languages, so that no one could understand the other.

So the Lord scattered them abroad from thence upon the face of all the Earth; and they left off to build the city. Therefore is the name of it called Babel, because the Lord did there confound the language of all the Earth; and from thence did the Lord scatter them abroad.

But even after God had made a mock of this foolish Tower of Babel, men continued to stumble and fall, and behave like infants learning to walk. Instead of praying to God, they made images of many gods and prayed to them. They prayed to the Sun because it warmed them. They prayed to fire because they were afraid of it.

God wished them to understand that everything they saw with their eyes—the Sun, fire, animals, and the whole world—was the work of His hands. He wanted them to understand that the Sun warmed them and made the Earth beautiful because He had ordained it. More than everything else, He wanted man not to be a coward, but a strong, intelligent creature, trusting in the power of the great Creator, and setting himself to get dominion over the Earth.

At this time there lived in the world a mighty man named Nimrod, who obeyed God in going forth to conquer the world. He was a great hunter, and men feared him and obeyed him. He gathered people about him, and went across the world founding cities. He is the first monarch that ever existed, for men made him their king.

But Nimrod's empire was poisoned by idolatry; for, although he built mighty cities, the people who dwelt in them were weak and cowardly. They made images and prayed to them. They were superstitious and worshipped animals.

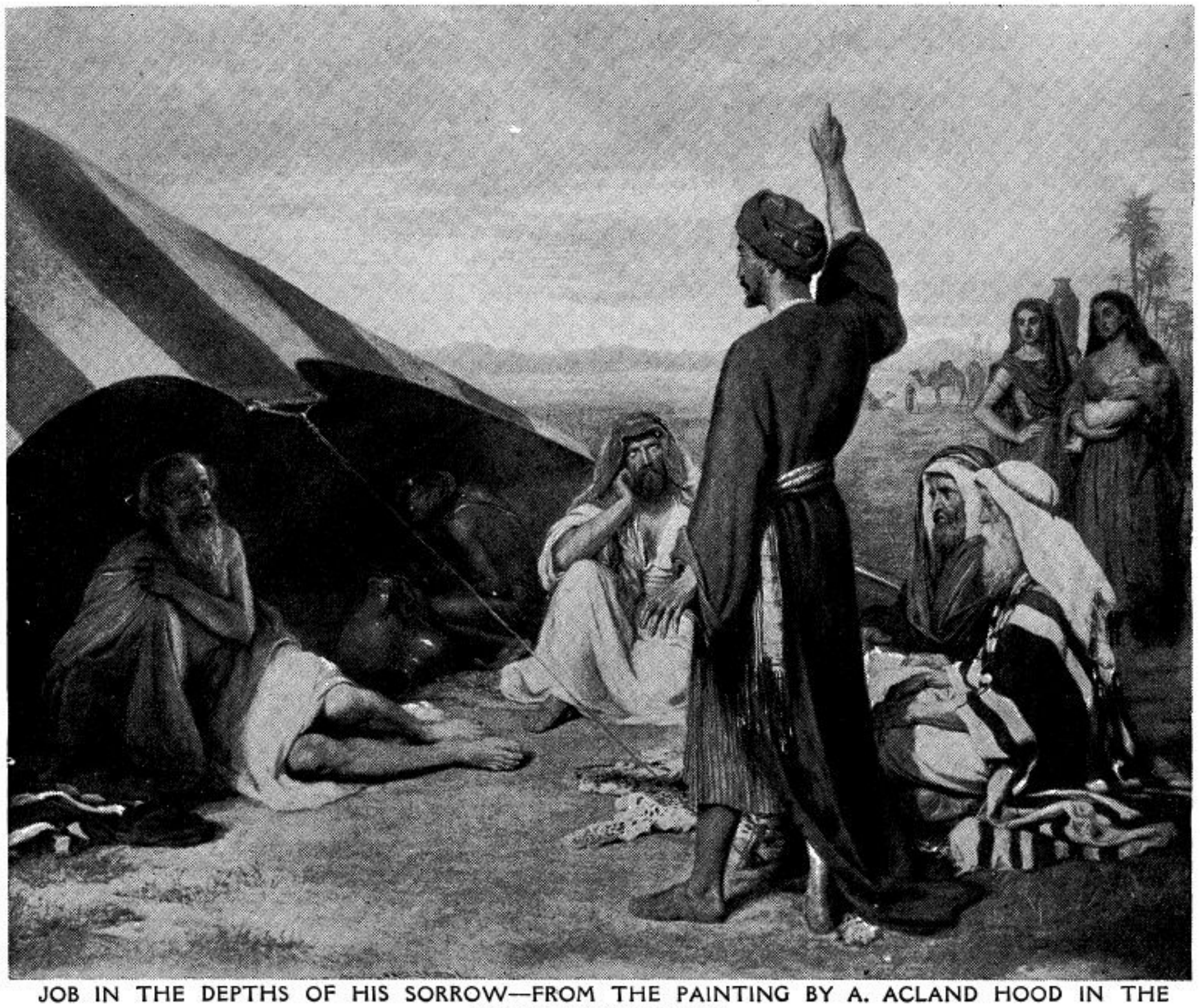
God could not be pleased with such people. He had ordained that men should have dominion. He had purposed that men should count the stars, weigh the suns, and harness the waters to their service, and control the mighty forces of Nature. How could He hope for such things from a people who trembled at a shadow, grovelled in the dust before images, and worshipped animals?

But all men at that time were not sunken in folly and wickedness. There was one, at least, we are told, who had the soul of a hero. This was that great and splendid spirit called Job. Job's story is told late in the Old Testament, but it is possible that he lived in the evil time between the Flood and the call of Abraham.

Job was a rich man. He was a great lord, the master of servants, the owner of much land, the farmer of many flocks and herds. He was also a happy man, living cheerfully with his family, enjoying life with a good appetite, and praising God who had blessed him with so much happiness and comfort.

There were, no doubt, many who said: "It is easy for this great lord to believe in God, but how would it be with him if he became poor and miserable like us? Where would his faith be then? It is easy enough to be good when you are rich."

But God tried Job. A storm arose from the desert, and, sweeping down a house in which Job's children were assembled, crushed them to death. Then a storm destroyed his flocks; robbers made away with his camels, his oxen, and his asses; and upon Job himself there fell the terrible and awful doom of leprosy. His wife hastened from him; his friends withdrew themselves; the poor, stricken man was left alone, deserted and cursed, smitten with sores from the sole of his foot even unto his crown, and childless. In this appalling ruin Job uttered words which we say to this day when we bury our dead: "The Lord gave, and the Lord hath taken away; blessed be the Name of the Lord."



JOB IN THE DEPTHS OF HIS SORROW—FROM THE PAINTING BY A. ACLAND HOOD IN THE MAIDSTONE MUSEUM

But Job was not perfect, and when three of his old friends journeyed to see him from far countries, and comforted him by saying he must have sinned to bring this calamity upon his head (such to this day we call Job's comforters), he suddenly rebelled against his doom, and cursed the day that he was born.

But as he talked, often in a strain of fine poetry, he regained his composure and faith.

Here is his picture of what man, even in Job's day, could do in *mining*—his description of work underground.

THE HOUR OF JOB'S TRIAL DRAWS NEAR

JOB AND HIS FAMILY IN THE DAYS OF THEIR PROSPERITY

JOB RECEIVES BAD TIDINGS—THE BEGINNING OF HIS TERRIBLE SUFFERING

Surely there is a vein for the silver and a place for the gold where they fine it ?

Iron is taken out of the Earth, and brass is molten out of the stone.

He setteth an end to darkness and searcheth out all perfection ; the stones of darkness and the shadow of death.

The flood breaketh out from the inhabitant, even the waters forgotten of the foot ; they are dried up, they are gone away from men.

As for the Earth, out of it cometh bread, and under it is turned up as it were fire.

There is a path which no fowl knoweth, and which the vulture's eye hath not seen ;

The lions' whelps have not trodden it, nor the fierce lion passed by it.

He putteth his hand forth upon the rock, he overturneth the mountains by the roots :

He cutteth out rivers among the rocks ; and his eye seeth every precious thing.

He bindeth the floods from overflowing, and the thing that is hid he bringeth to light.

THE FEAR OF THE LORD IS THE BEGINNING OF WISDOM

All this man can do, says Job, in the deep darkness of the Earth, but there is much he cannot do, so Job continues :

But where shall wisdom be found ?
And where is the place of understanding ?
Man knoweth not the price thereof.
The depth saith, It is not in me ;
And the sea saith it is not with me.
It cannot be gotten for gold,
It cannot be valued with the gold of Ophir.
Whence cometh wisdom ? And where is the place of understanding ?
Behold, the fear of the Lord, that is wisdom ;
And to depart from evil is understanding.

So in the midst of the argument which followed between Job and his comforters, the poor, smitten man regained some of his faith, and uttered many noble words concerning the providence of God.

But finally God showed Job the whole truth of the matter. He showed that no man can judge God ; first, because no man existed when God created the heavens and the Earth, and therefore no man knows His purposes, and, secondly, because no man has passed through the gates of Death, and therefore no man knows what God has prepared for us in the endless ages of eternity. A man can only judge a tiny part of a great whole.

These are some of the mighty words, unequalled in all the books of the world, which came to Job from God :

Who is this that darkeneth counsel by words without knowledge ?

Where wast thou when I laid the foundations of the Earth ; when the morning stars sang together, and all the sons of God shouted for joy ?

Have the gates of death been opened unto thee ? Or hast thou seen the doors of the shadows of death ?

Canst thou bind the sweet influences of Pleiades, or loose the bands of Orion ?

Knowest thou the ordinances of heaven ? Canst thou set the dominion thereof in the Earth ?

Hast thou given the horse strength ? Hast thou clothed his neck with thunder ?

Doth the hawk fly by thy wisdom ? Doth the eagle mount up at thy command ?

Shall he that contendeth with the Almighty instruct Him ? He that reproveth God let him answer it !

Then Job answered and said :

Behold, I am vile : what shall I answer Thee ?
I will lay mine hand upon my mouth.

THE PATIENT AND OBEDIENT JOB IS BLESSED AT LAST

So when God had tried Job, and had made him humble and obedient, He blessed him again, and Job lived in honour and health, praising God all the days of his life.

Not only is the story of Job one of the greatest in the world, but it is the story of one of the first faithful men in the history of the race. Very probably Job lived in the dark and evil days after the Flood. He lived at a time when men were cowardly, superstitious, disobedient, and foolish. He lived at a time when mankind were likely to perish through sin and ignorance, and he is a great hero. But he was not the man chosen by God to raise the human race from the slough of sin, and help it forward once more on its path of clean and healthy progress.

There was another and a greater man, a man whose title is sublime, for he is called "The Friend of God," and his story we shall read at another time.

But we should pause here a moment to consider those early days of our history. God wanted men to advance and develop their reason. They disobeyed, and lived wicked lives of pleasure. They prayed to sticks and stones ; they were afraid of dead bodies ; they made gods of animals. There are people still in the world, after all these thousands of years, doing exactly the same thing.

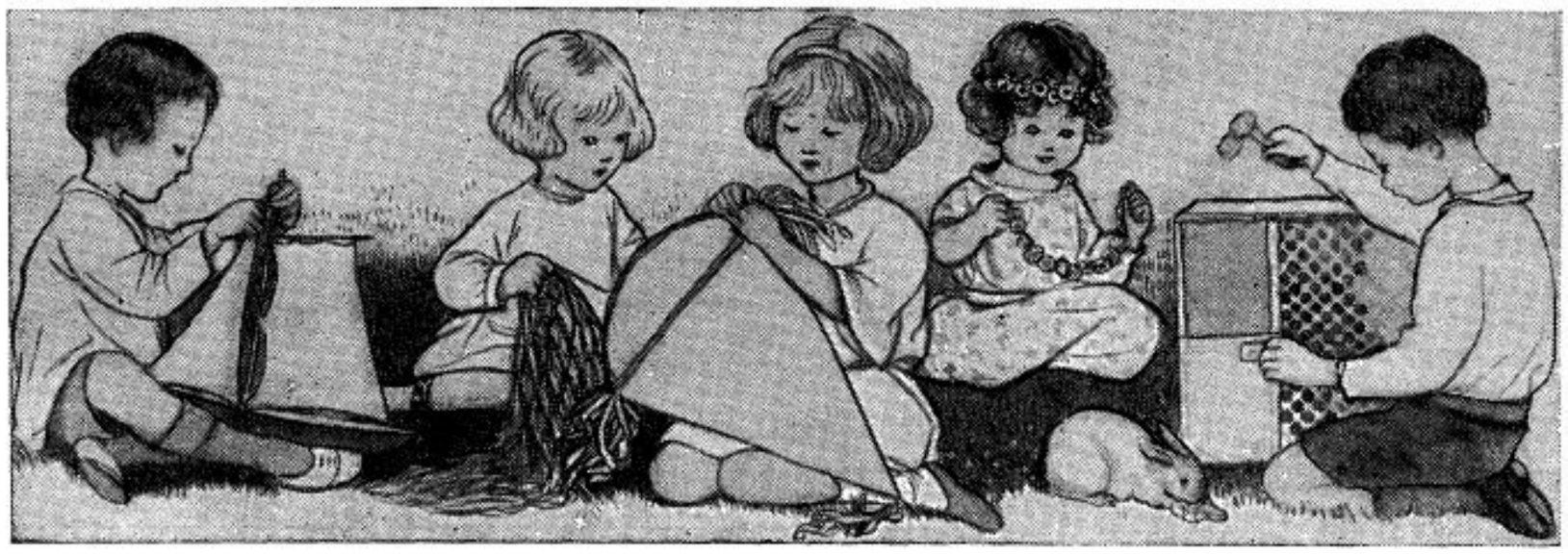
THE MAN WHO TRUSTED THE INVISIBLE CREATOR OF THE VISIBLE WORLD

Then God chose a man who trusted in Him—a man who worshipped, loved, and trusted the invisible Creator of the visible world, and God said :

I will make of thee a great nation, and make thy name great, and in thee shall all the families of the Earth be blessed.

It is from this man, The Friend of God, that we ourselves are descended, we and all those nations who advance reverently in knowledge and faith.

The Interests and Pleasures of Life for All Indoors and Out

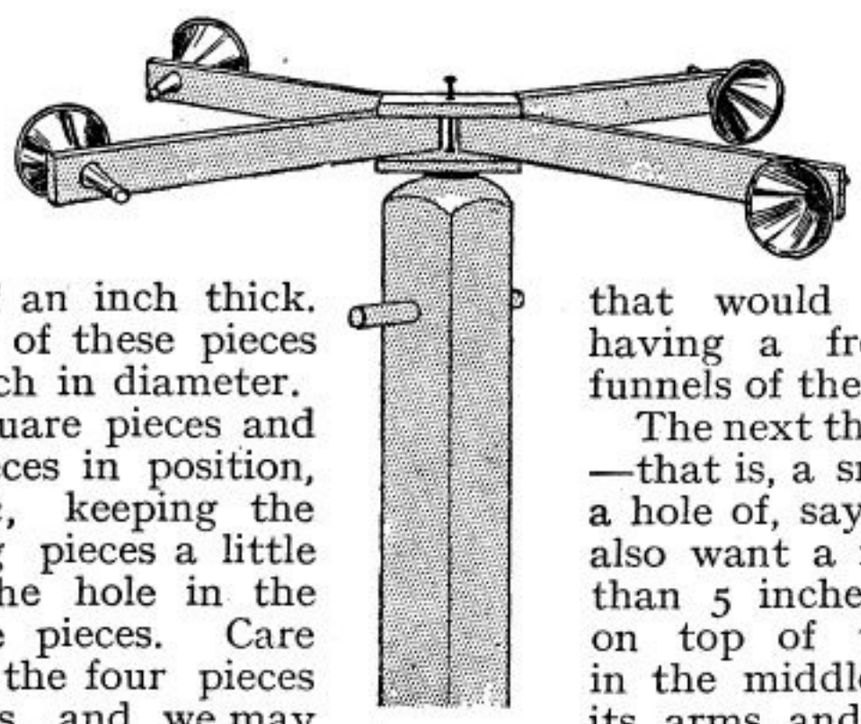


A TOY TO MEASURE THE WIND

ANY boy can make an interesting toy that will enable him to appreciate the force of the wind, and even, to some extent, to tell the speed of the wind.

The first things required are two pieces of wood 3 inches square and half an inch thick. Through the middle of each square make a hole about three-eighths of an inch in diameter. Now take four pieces of wood 15 inches long, 2 inches wide, and half an inch thick. Near one end of each of these pieces make a round hole 1 inch in diameter.

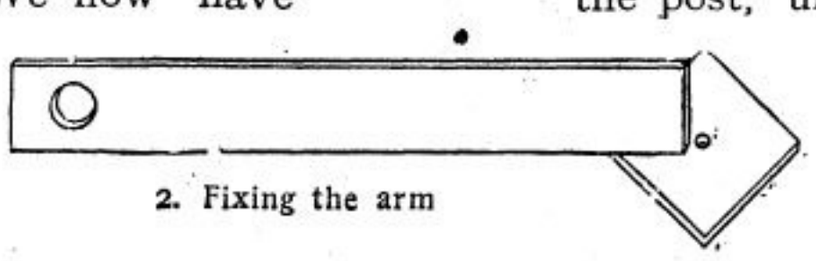
Now take the two square pieces and nail the four long pieces in position, as shown in picture 2, keeping the inside ends of the long pieces a little distance away from the hole in the middle of the square pieces. Care must be taken to make the four pieces exactly at right angles, and we may see if we have done so by measuring the distances from tip to tip of any two adjoining ones. These distances should be all alike. We now have something resembling the top of a signpost at two cross-roads. We can paint it any colour we like, so that the wind-speeder, as we will call it, may stand the weather.



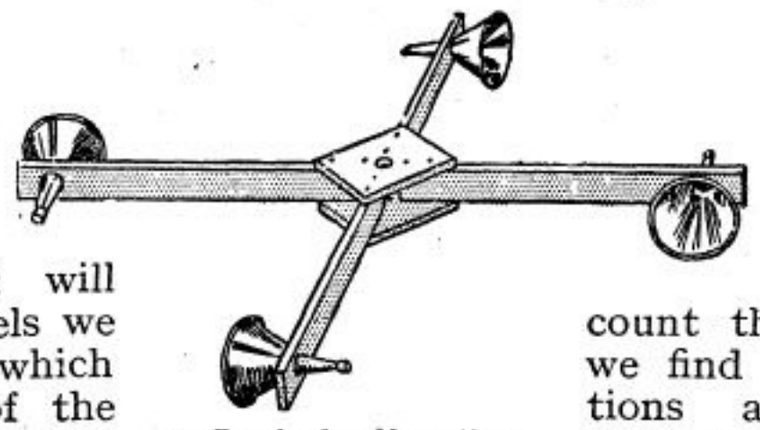
1. The wind measurer ready for work

We now get four tin funnels, or fillers, 4 or 6 inches diameter at the mouth, and into the spout of each put a cork that will close the end. These funnels we place in the round holes which were made near the tips of the wooden arms. They must be put in position, as seen in picture 1, so that the wind will blow into the mouth of each in turn, as the arms spin round. The funnels should be pushed in tightly. Each funnel may be painted a different colour, and this will help to let us judge the speed at which the wind blows them round. Next we want a post erected in the garden, so that the revolving speeder may be mounted on top of it. If there are any wooden clothes-posts about it may be mounted on top of one of them. Choose a post as far as possible from any walls that would prevent the wind from having a free course to reach the funnels of the speeder.

The next thing to do is to get a washer —that is, a small flat ring of iron with a hole of, say, half-inch size. We shall also want a round iron nail, not less than 5 inches long. Put the washer on top of the wooden post, right in the middle, put the speeder with its arms and funnels on top of the washer, and drive the nail down through the hole in the centre of the speeder through the washer and into the post, until the head of the nail is about half an inch above the top of the speeder. Now we can let the wind do its work. It will send the speeder merrily round when it blows briskly. We can count how often the arms go round in a minute, and the different colours of the funnel will enable us to count the revolutions easily. If we find that one day the revolutions are more each minute than on another day, we can tell that the wind is stronger; if the revolutions are fewer we shall know that the wind is not so strong.



2. Fixing the arm



3. Ready for Mounting

LITTLE PROBLEMS FOR CLEVER PEOPLE

THESE problems are continued from page 382, and below are answers to the problems appearing on that page.

31. How Long was the Train?

As I was waiting at the station, a train took 9 seconds to pass me; and to go through the station, which is 88 yards long, it took 21 seconds. How long was the train?

32. What Were the Distances?

A farmer drove to Chester at 8 miles an hour, and returned home by a road 2 miles longer at 10 miles an hour. He found that the return journey took 12 minutes less than the outward. How long was each road?

33. What Did the Large Sack Contain?

"There are 40 bushels of corn in those 2 sacks," said the merchant, "and the smaller has 5 bushels less than half the quantity in the larger." How many were in the big sack?

34. How Many Trains?

A train leaves New York for San Francisco every morning at 9 o'clock, and another leaves San Francisco for New York every morning also at 9 o'clock. Each train takes exactly six days to make the journey across the continent. If I travel in one of these trains, how many trains shall I pass coming in the opposite direction?

35. Was It Quicker to Cycle?

James and John are cycling from Liverpool to a village 20 miles distant, and when they have gone only 4 miles John's machine breaks down. They wish to reach their destination at the same time. They can both walk or they can use the cycle alternately. They can walk 4 miles an hour and cycle 8 miles an hour. Which is the quicker way?

36. How Long Were the Candles?

I had two candles, one of them an inch longer than the other. I lit the longer at 4.30 and the shorter at 6. At 8.30 they were both the same length. The first burnt out at 10.30 and the second at 10 o'clock.

How long were they before I lit them?

37. When Will Harry Have a Pony?

Harry, aged 12, has been promised a pony when he is one-third the age of his father, who is now 56 years old.

When will Harry get the pony?

38. How Much Water was Spilt?

A boat leaving a wreck had water to last 13 days, allowing each man one quart each day. After 5 days some water was spilt, and one man died on the same day. The water then lasted just the expected time. How much water was spilt?

THE ANSWERS TO THE PROBLEMS ON PAGE 382

20. By 8.30 Alfred has walked one-fourth of the way, and in another 5 minutes he has walked one-third of the way. The difference between one-third and one-fourth is one-twelfth, so that he walks one-twelfth of the distance in 5 minutes. At 8.30 he still has three-fourths, or nine-twelfths, of the distance to go, and this will take him 9 times 5 minutes, or three-fourths of an hour. He therefore arrives at school at 9.15.

21. From noon on Monday to 8 o'clock on Wednesday morning is 44 hours. His father's watch, therefore, lost 3 minutes in 44 hours. But it was right when it had lost only 2 minutes, which it would do in two-thirds of 44 hours—that is, in 29 hours 20 minutes. This number of hours from noon on Monday would make it 5.20 on Tuesday afternoon.

22. Try one saloon first. This will seat 9, and leave 50. There is not an exact number of 4's in 50, so that four-seaters would not do. Next try two saloons. These will seat 18, and leave 41, which, again, cannot be fitted in. Next, 3 saloons will seat 27, and leave 32. Now, 8 four-seaters will seat exactly 32, so that the manager must have sent 3 saloons and 8 four-seaters.

23. The hare makes 3 leaps while the hound makes 2, so that she makes 9 while the hound makes 6. But the hound goes as far in these 6 leaps as the hare does in 14, so that the hare loses a distance equal to 5 of her own leaps in every 6 leaps the hound takes. She will therefore lose 60 leaps while the hound takes 72—that is, the hound catches her when he has made 72 leaps.

24. The customer received 3 pastries (worth 1s.), 15 chocolates (worth 7½d.), and 2 caramels (worth ½d.), making 20 in all for 20 pence.

25. This is what is usually known as a "catch"; and the answer is that, as they stood, they faced each other, one looking north and the other south.

26. One-third of the seats were filled at 1s. each. At 6d. each two-thirds would have yielded the same amount. Therefore, had the hall been filled, the remaining third would have yielded £5, so that there were 200 in that third, or 600 seats in the hall altogether.

27. Forty boys remained at school, and when the master divided up the ten pounds among the scholars he added the ten who were away sick to the forty who were there, making fifty portions into which the ten pounds had to be divided. This gave each boy the sum of four shillings. If the ten absent boys had not received their share then, of course, the forty would have had five shillings each.

28. If we divide 60 minutes by the number of trains an hour, we get the number of minutes between each train. If there were 3 more trains per hour there would be 1 minute less between each train. We therefore have to find two numbers whose difference is 3, and which, when divided into 60, give results which differ by 1. The numbers which divide 60 are 2, 3, 4, 5, 6, 10, 12, 15, 20, 30. First, those which differ by 3 are 2, 5; 3, 6; and 12, 15. Of these, the pair which give results differing by 1 when divided into 60 is 12, 15. Hence there were 12 trains an hour, which is a train every 5 minutes. The passenger waited 4 minutes.

29. With no current Duncan would go three-quarters of a mile in one quarter of an hour—that is, 3 miles an hour; but he actually goes only at the rate of 1½ miles per hour, and the difference between 3 miles and 1½ miles is the speed of the current, which is, therefore, 1½ miles an hour.

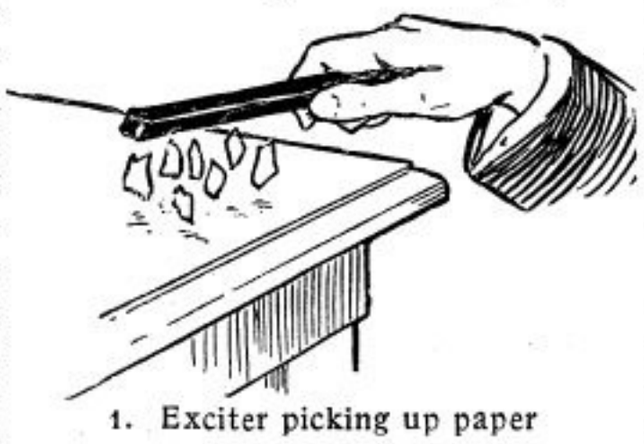
30. Fred and Albert crossed the ferry first, and Fred brought back the boat. Then the father crossed alone, and Albert returned with the boat. The boys again crossed together; and Fred brought back the boat in which the postman crossed alone. Albert then rowed across to the starting shore, and brought back his brother.

ELECTRICITY AT HOME

We read on another page of electricity and its marvellous powers. It is the most powerful and the most mysterious force in the world. Yet the knowledge of it is almost new. It is easy to push a button or press a knob up or down and so light up a room with electric light, but this has been possible only during the last twenty or thirty years. When our grandfathers were boys electric lighting was unknown.

The experiments which made the powers of electricity known go back much farther, and it is getting on for 200 years since Benjamin Franklin began to find out something about this mysterious power. Some of the methods he used were very simple, and any boy can try them for himself.

Take a piece of ordinary brown paper, and warm it before the fire. When it is hot lay it on the table and brush it briskly with a warm, dry clothes brush. You then pick it up quickly and hold it to the wall. You will find that the paper has become electrified, and that it will cling to the wall. It clings because it is *electrified* and is attracting the wall to it. If you warm the paper and brush it as before, and then hold it over some little bits of lighter paper, the small pieces will fly up and cling to the electrified paper.



1. Exciter picking up paper

It is even possible to get sparks from electrified paper. Take a large sheet of stout drawing-paper, warm it till it is thoroughly dry, lay it on a dry wooden table, and rub it very briskly with a piece of flannel. Then put a piece of metal—a watch-chain or a bunch of keys—in the middle and lift the paper off the table by two corners. Then, if someone else puts his knuckle or finger to the metal, a bright spark will pass between his finger and the metal, which, however, he will not feel. If the weather and the paper are thoroughly dry, you may get a spark an inch long.

But paper is not the best thing with which to try these experiments. For one reason, it will not retain electricity very long, and for another it is not the easiest substance to electrify.

A piece of glass rod or tube is a better *exciter*, as we call anything electrified by rubbing. A solid rod is the better, and a chemist can sell us a piece for a few pence. To excite, or electrify, this we must rub it briskly with a piece of dry silk. Or we can take a stick of ordinary sealing-wax, which must be rubbed with flannel.

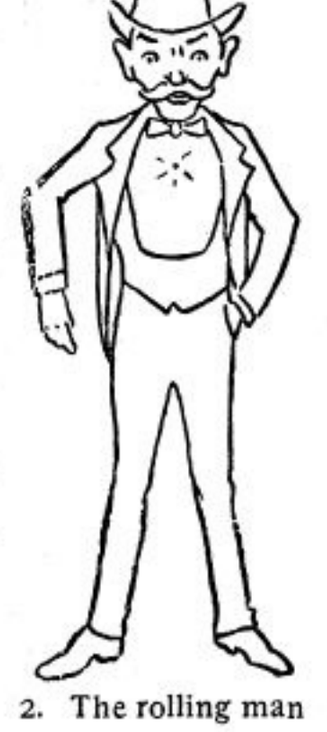
A third kind of exciter, and a very good one, is a piece of vulcanite rubbed with flannel. Vulcanite is hard rubber, and fountain-pens are generally made of it. So if we can get an old fountain-pen it will do very well.

We take our glass rod, sealing-wax, or fountain-pen, and excite it by rubbing with the silk or flannel. Then we hold it near some tiny scraps of paper or bits of bran, and it will pick them up, as seen in picture 1.

We must be careful that everything is quite dry, and the articles must be warmed before the fire to make sure they are dry. All experiments with this kind of electricity will fail most disappointingly unless everything is warm and dry, including the weather. We shall find sometimes that the rod will pick up the paper, and afterwards will not attract the same piece. This is because the little bit of paper has received a charge of electricity from the rod, and when two electrified bodies come together they repel one another, if both are electrified with the same sort of electricity.

If the bodies are charged with opposite kinds of electricity they will attract one another. These two sorts of electricity are called *positive* and *negative* electricity. Glass rubbed with silk gives positive electricity, and sealing-wax or vulcanite rubbed with flannel gives negative electricity.

Take a piece of thin paper—the white edge of a newspaper would do—and cut a strip, say, about four inches long and about an inch wide. Double it over and bring the two ends together. Now draw a man as shown in picture 2, and cut it out, taking care not to cut the hat, so that the figure when folded along the dotted line will stand up. If you excite the glass rod, and hold it near one side, the figure will roll over toward it, and if you then hold the excited vulcanite or sealing-wax at the other side he will roll back that way, and so you can attract him all round the table.



2. The rolling man

Another experiment is to make a tiny ball of pith out of the centre of an elderberry stick. This pith is very light when it is dry, and can easily be made into a small ball about as big as a pea.

Fix the ball to a silk thread, and the silk to an electric fitting, or something where it can hang down. Now excite the rod by rubbing and hold it near. The pith-ball will fly toward the rod, but after touching it it flies away again, and will keep off as long as the electricity remains in the rod. But if you have used the glass rod and then bring the vulcanite or seal-

ing-wax near, the ball will fly to it. This shows the difference between the two kinds of electricity.

In place of the pith-ball we can use a little piece of feather if we cannot get the pith, but pith is the better. Instead of hanging the pith-ball from some bracket, we can easily make a stand as shown in picture 6. This is made of a bottle with a piece of copper wire stuck through the cork. We bend the wire over as shown, and make a loop in it to which to tie the silk thread.

With the pith-ball we can prove that when we rub the glass with silk, or the vulcanite or the sealing-wax with flannel, the silk or the flannel also becomes electrified. If we roll the silk or flannel into a ball, and after rubbing the rod with it hold it near the pith-ball, the effect will be the same as if we held the rod near the ball.

Take a piece of the white margin of a newspaper and draw a picture on it like picture 7, about two inches in height. Then cut it out to shape. Cut a small hole at the hands, but be careful to cut it round and clean. Make it big enough for the head of a pin to go through. Now we take a piece of cotton thread and run one end through the hole in the paper acrobat.

We now tie the ends of the cotton to two chairs or other objects, but we must see that the thread is drawn quite tight, as seen in picture 3. If we excite the rod we can make the paper acrobat swing round and round after the rod.

The pith-ball electroscope is a contrivance which will be very useful in many electrical experiments, and it is easily made. With the electroscope we can always test the presence of electricity, and make a good estimate of its strength. We take a glass pickle bottle with a big neck, and clean and dry it thoroughly. Then we put a piece of copper wire through the cork. We can do this if we make a hole in the cork with a skewer or a nail.

The wire should be a little thicker than ordinary electric-bell wire. If we have to buy it we ask for No. 14, but any piece of fairly stiff copper wire will do. When we have put it through the cork, we bend one end—the one to go *inside* the bottle—into a small hook-shape. The other end first has to be bent round like a ring, and then the ring must be bent down at a right angle. Then we shall have a piece like picture 4.

Now make two small pith-balls and hang them each on a piece of cotton, both pieces being of the same length. Tie the two ends to the hook in the wire and put them into the bottle and fix in the cork.

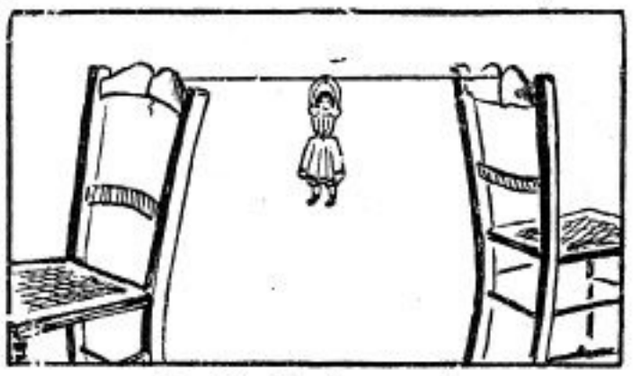
The pith-balls should then be about two inches or three inches from the bottom of the bottle, as shown in picture 5.

Of course, we must not forget to see that the bottle and everything else is quite dry. If we excite the rod and touch the top of the wire with it, the two pith-balls will become excited; and, as both will be charged with the same sort of electricity, they will stand out apart from each other, and if we bring anything which is electrified against the copper wire we shall see the pith-balls move.

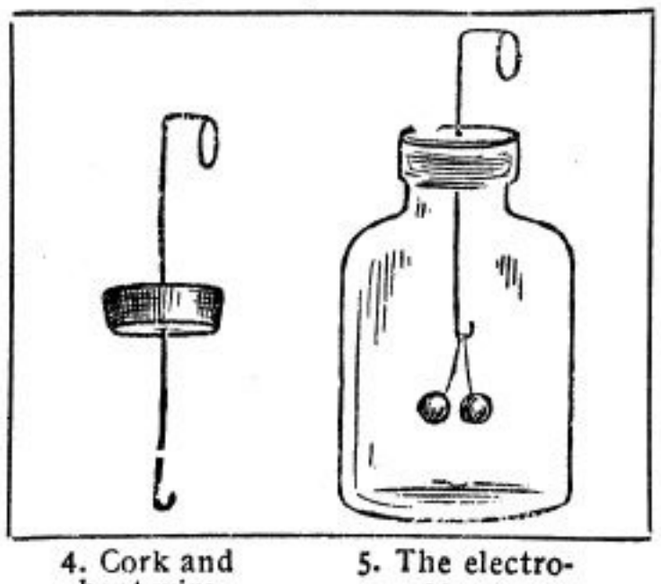
We can make electricity on a larger scale than this. Borrow a lacquered wooden tray and cut out a piece of thick, heavy brown paper, the same size as the inside of the tray, so that it lies flat on the bottom of the tray.

Gum two slips of paper at each end of the sheet to serve as handles. Have the tray supported on two dry glass tumblers—to prevent the electricity leaking away—and warm the sheet of paper at the fire until it is thoroughly dry and hot. Rubbing will help to dry it. Then put it quickly on the table and brush it hard with a warm and dry, stiff clothes brush. Put it on your tea tray which is resting on the tumblers, touch the tray with your finger, and lift away the sheet of paper by the handles you have fixed to it. Then put your knuckle close to the tray and you will get a spark, which you can get half a dozen times if you repeat the process of touching the tray, lifting away the brown paper, and putting your knuckle to the tray.

These experiments are the simplest we can undertake, and it was by such experiments that great inventors came to understand the mysterious powers of the force that makes possible the telephone and the telegraph, and the motors and dynamos that drive railway trains and tram-cars.



3. Ready for work



4. Cork and bent wire

5. The electroscope

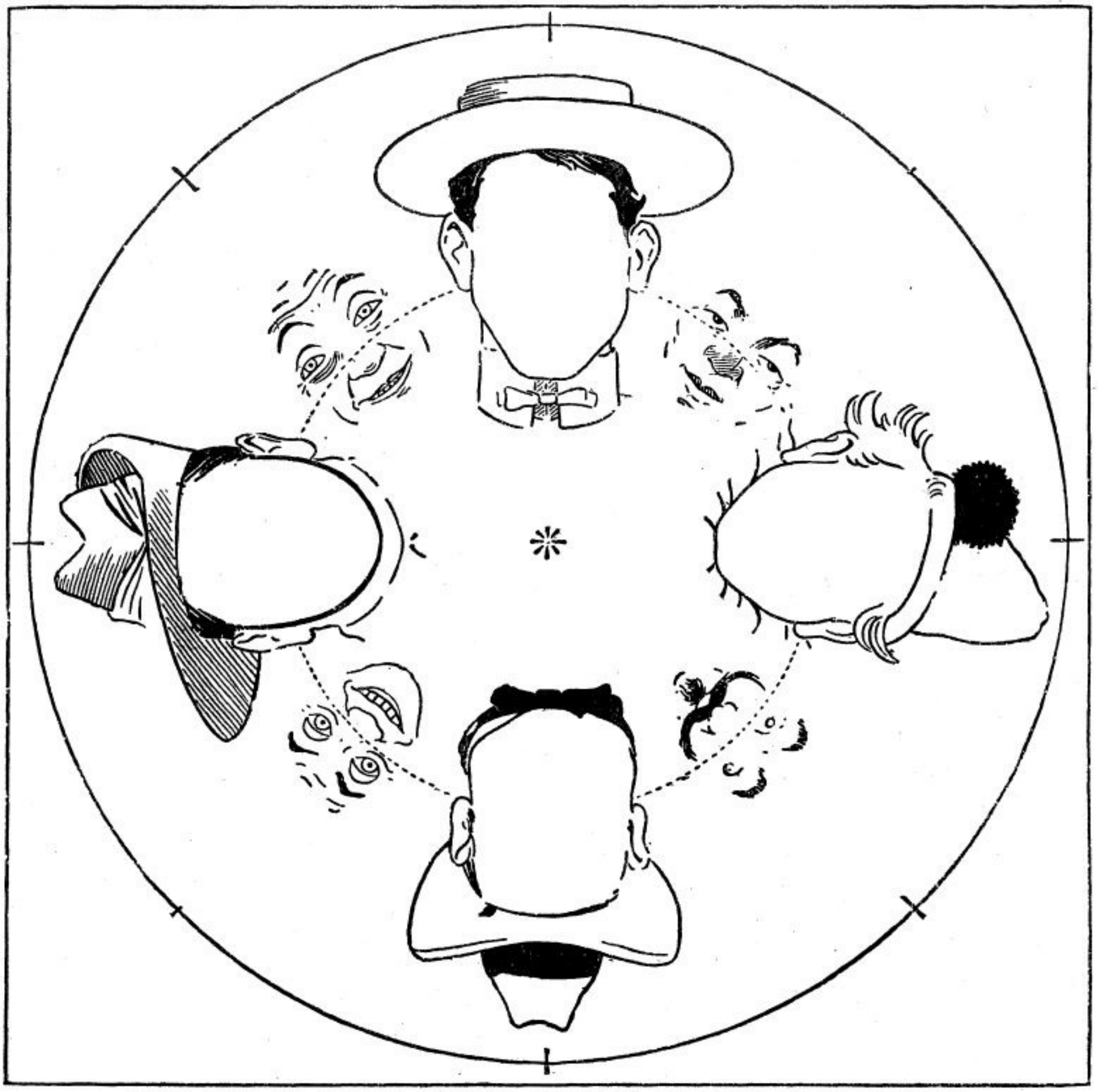
6. An easily-made stand

7. The acrobat

HOW TO DRAW HUNDREDS OF FACES

With the diagram on this page we can draw hundreds of different pictures, though we may not be artists in any sense of the word. First of all we should take a piece of good tracing paper and trace the diagram upon it quite carefully and accurately. Then we should ink over the lines, and when the ink is quite dry paste the tracing paper with the design upon a piece of cardboard. To do this, cover the card with a smooth paste and lay the tracing paper upon it, smoothing out all wrinkles with a clean cloth. When this is dry we are ready to draw any number of faces. Take another piece of tracing paper and pin it down upon the card, pressing the pin through the centre of the diagram where a star is marked. Now we must trace any one of the hats upon the transparent paper. Then let us turn the paper round until the hat that we have drawn comes over one of the other hats in the diagram. Now trace the shape of the face that appears under our hat. Again turn the tracing paper round until one of the pairs of eyes comes into position within the outline of a face that we have drawn. Trace the eyes with pencil, and finally turn the paper round to another position and trace a nose and mouth. We now have a complete face with eyes, nose, mouth, hair, and hat.

By turning the paper round and drawing different eyes in the different face outlines, and putting sometimes one hat or mouth and sometimes another, we are able to make hundreds of different pictures. There are one or two things to remember if we want to be successful in thus producing an imaginary portrait gallery. The tracing paper must be pinned down firmly upon the card, and must not be allowed to shift about, or the different parts of the different faces will not join up properly. We should use a soft blacklead pencil in tracing the faces, and we must not press too heavily.



WITH THE AID OF THIS DIAGRAM HUNDREDS OF FACES CAN BE DRAWN

VERSES MADE WITH FIGURES AND LETTERS

WRITERS of verses have shown a great deal of ingenuity in using for their rhymes words that can be expressed by figures or single letters, which, when pronounced, give the sound almost exactly of the words represented.

A great deal of amusement may be obtained by gathering a party round the table with pencils and paper, and seeing who, in a given time, can make up the best rhymes in this way. The examples given here will show how the letters and figures are worked into the lines. The first little poem is a good specimen of the use of single letters as a substitute for actual words.

The Chinaman praiseth his T's,
  The mandarin praiseth his Q;
The gardener praiseth his turnips and P's,
  But I praise U.

The mariner loveth the C's,
  The bagatelle-player his Q;
The husbandman loveth his cattle and B's,
  But I love U.

The foolish have need of the Y's,
  The actor needeth his Q;
The pilot hath need of two excellent I's,
  But I need U.

The hunter seeketh the J's,
  The shepherd seeketh his U;
The college boys seek their final B.A.,
  But I C Q.

Here is one of the nonsense rhymes called Limericks in which figures are very cleverly worked in to represent syllables.

There was an archbishop named T8,
Who dined with a friend at 8.8;
  But, sad to relate,
  I'm unable to state
What T8's t8-à-t8 8 at 8.8.

Another Limerick in which the figure 8 is introduced in a very similar way is this.

They dined all alone at 8.8,
On oysters they dined and 8 8;
  And he asked his dear K8
  To tell him his f8
When they 8 t8-à-t8 at 8.8.

Here is another verse in which letters are used to take the place of a word.

A budding author, something new
Submitting, signed himself X Q;
The editor the paper read.
And begged he might be X Q Z.

One little verse was headed U C I D K, and, after puzzling over this title for some time, the editor to whom it had been sent managed to discover what it meant.

The title was, of course, "You see I decay." And this is how the verse ran.

Surely, good sir, you follow me?
It is as plain as A B C;
Repeat it in a treble clef,
For I am rather D E F.

Here is an example of verses in which double letters are used all through for the rhyming words. This is more difficult to arrange. The double Y, of course, stands for "Wise," and so on.

There is a farmer who is Y Y
  Enough to take his E E,
And study Nature with his I I,
  And think of what he C C.

He hears the chatter of the J J,
  As they each other T T,
And sees that when a tree D K K
  It makes a home for B B.

A yoke of oxen he will U U,
  With many whoas and G G,
And their mistakes he will X Q Q
  When ploughing for his P P.

He little buys, but much he sells,
  And therefore little O O;
And when he hoes his soil by spells,
  He also soils his hose.

Perhaps one of the best poems in which letters are used for words is A Maid of R K D.

A dainty maid of R K D
  Is F E in her bower;
Smart as U C A honey-B;
  And sweet as N E flower.

Does she S A herself 2 please,
  X Q Q the little miss,
She sings an L E G 2 T T,
  Or blows an M T kiss.

B mine, I say, U bonny J,
  B4 U R mine L (my knell);
When U R gay, my hopes D K,
  In T-sing U X L.

Without ado she takes the Q,
  Her I I B9 and B D;
O, sir, I do not N V U,
  I C U R so need E.

O F E U I C R true,
  Y need I C Q less?
I'll never D V 8 from U,
  But end my cares with S.

Most of this is good, except the last line, which needs to be explained. By "ending cares with S," the maid ends with "caress."

WHAT TO DO WITH A BOX OF BEADS

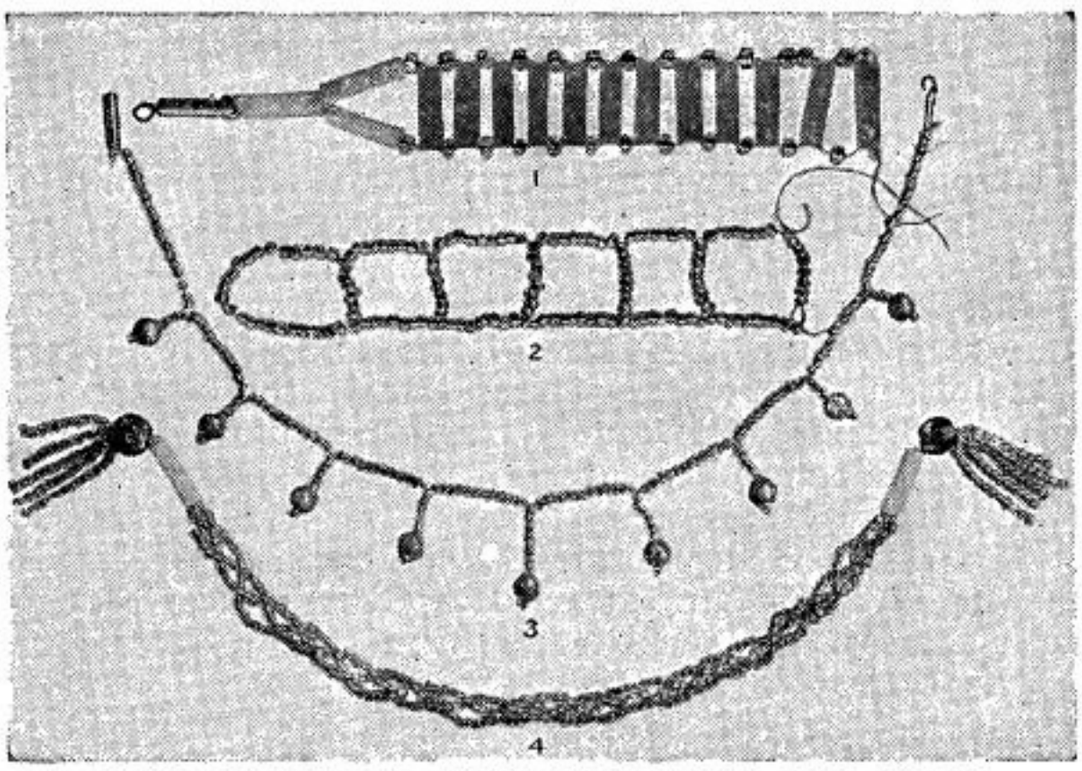
We all know how to thread beads, and many little girls can make a ring of beads for their finger; but here we are going to see how to make something more interesting than chains and rings.

We shall want two little bundles of glass beads, one pink and one blue, and a few bugle beads, the long round ones that are like little tubes.

The beads may be bought in "hanks" at a toyshop, and contain twelve rows of beads.

In picture 4 we see a plaited necklace with tasselled ends, fit for a big doll. To make this necklace separate three rows of beads from the hank, and, without letting any slide off the cotton, carefully knot the threads at one end; then plait the three rows of beads—in the same way as we should plait our hair. Then knot the other ends of the cotton close up to the finish of the plait.

Now with a needle and thread we begin the tassels. We notice that a bugle comes next to the plait. To fix this on we must tie the end of a thread (attached to the needle) to the end of the plait with a small knot, and then thread on the bugle in the usual way. Next thread on a big round bead of some pretty colour—a pearl bead will look well if we can find one—and then take *one* of the glass beads from the hank and thread that on. Hold it close up to the big bead and put the needle through it *again*, drawing the cotton tightly round the bead. This bead will now be firmly fixed; it keeps the big bead and the bugle in position while we make the tassel.



BEAD BRACELETS AND NECKLACES FOR DOLLS

Still with the same thread take up twelve glass beads, push them up close to the fixed bead, and fix the last one—the twelfth bead—in the same way by passing the cotton through again and drawing it tightly. Now we have to pass our needle through the eleven beads again, bringing it out at the other end. Each piece of the tassel is made in this way. So you see there are *two* threads in each piece and a fixed bead at the end. Make five pieces and the tassel is complete. When we have made a tassel at the other end of the plait the necklace will be finished.

Now let us look at picture 3. This is a plain chain necklace with little bobs, or pendants, hanging from it all the way round.

We begin by attaching one end of an ordinary fastener to our thread. If we cannot find one of these from an old necklace, a piece of baby ribbon from a chocolate-box will make a pretty fastening.

Thread on about twenty pink beads, then one blue one, then four pink ones, one pearl (a good deal bigger, to form the bob), and then one blue one again. This last blue one has to be *fixed* in the way we have learned.

When the last blue bead is fixed return the needle *through* the pearl bead and also through the four pink ones; then thread on another blue bead and ten more pink ones. We now have the first pendant.

After the ten pink beads we must thread one more blue one, and make another pendant in the same way, then ten more pink beads, and so on, to the end of the necklace.

We can, of course, make it as long as we like, but we must decide how long it is to be before we start, because it is very tiresome to find that we have not enough cotton on the needle. It makes the necklace look nicer if we add one more pink bead to the pendant each time, until we get to the middle; then we must leave one off each time to make the other side match.

Picture 1 shows a ladder bracelet made of bugles and blue beads. For these ladders we must work with two threads instead of one.

We take about a yard for each needleful, and tie the ends of the two threads together with a big knot. Now we thread on one bugle and pass both needles and cottons through it; then we put on two bugles, one on each cotton; then a blue bead on each cotton. The next bugle that comes is the first step on the ladder and goes *across*.

To get this we have to put both needles through the bugle, one in at one end and one in at the other, so making the threads cross to the other side of the ladder. Next put on two blue beads, one each side, and then another crossway bugle in the same way as the last. We continue this until our chain is long enough for a bracelet, when we finish it off with three beads in the same position as the three we started with.

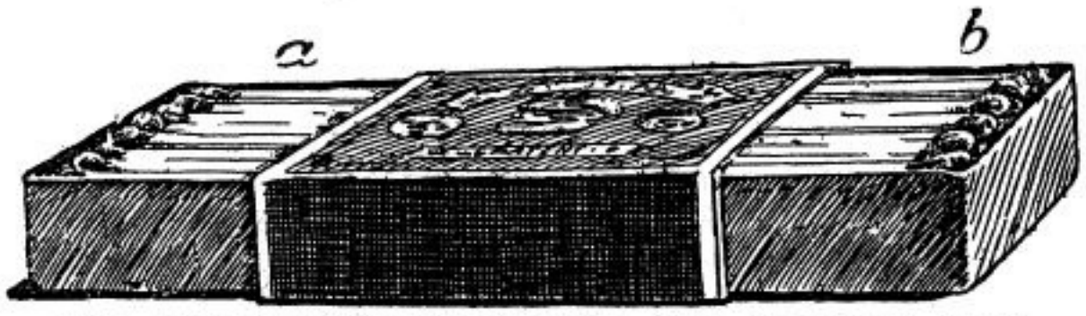
Picture 2 shows a ladder chain made of small beads only. It is made in the same way as the bugle ladder, with two threads.

We start with twelve beads on each thread, and then put eight across, then eight each side, and eight more across. If we find it slips out of place when we first begin, fix the last side bead of each eight before threading on the eight across.

THE INEXHAUSTIBLE MATCHBOX

EVERY boy has a yearning to be a conjurer, and within certain limits there is no reason why he should not. There are plenty of capital tricks that can be done by an intelligent boy, if he will take trouble, and the first we will give is the trick of the inexhaustible matchbox.

The effect is as follows. An ordinary small safety matchbox, after being shown full, is completely emptied, the matches being turned out upon the table-cloth. The box is closed. When again opened it is found to be full of matches, as at first. These also are turned out. Once more the box is closed, and once more a third batch of matches is shaken out, after which the operator endeavours to put them all back again, but without success, for even when packed as closely as possible, the box cannot be made to accommodate more than half those upon the table.



THE MAGIC MATCHBOX THAT ANY BOY MAY MAKE

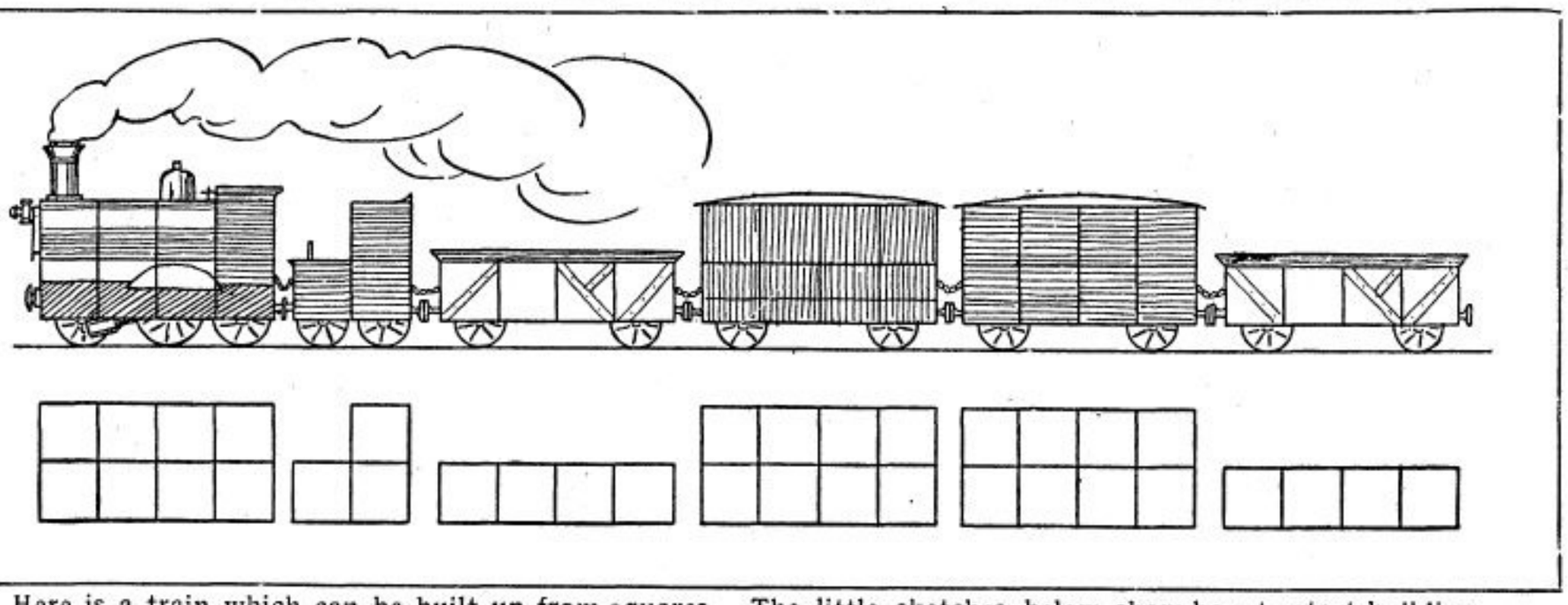
The secret lies mainly in the fact that the matchbox used, though ordinary in kind, has been specially prepared.

With a sharp penknife, split six or seven of the matches right down the middle. Take out the "drawer" portion of the box, turn it over, and smear the underside with glue or seccotine; then lay the half-matches, all pointing the same way, side by side upon it. If this is neatly done, the inverted drawer thus treated will give the appearance of a full one right side up. When the glue is dry, reverse the drawer again, replacing the matches that it contained. Push it half-way only into the outer case; and, into the opposite end of the same case, push the drawer portion also of another box. You will thus have two drawers in one case. The unprepared drawer is represented by *a*; the prepared one by *b*. This box, at a suitable moment, the owner brings forward as if it were one in ordinary use, taking care to keep the end *b* well covered by his right hand. Making some remark about the strange properties of matches of this brand, he offers to give an illustration of one of them. So saying, he shakes out the visible matches upon the table, and shows the box empty. Remarking "Now I will close the box again," he brings the left hand up to it, as if merely to push in the drawer, but, as a matter of fact, presses in *b* from the opposite end, thereby pushing out the empty drawer into his left hand, where it is hidden. He holds up the box fairly closed in the right hand,

This calls all eyes to the box, and gives him an opportunity to drop the empty drawer into his lap or other convenient object placed beforehand on the table. Then, blowing upon the box, and pronouncing some magical formula, he pushes open the box again, showing that it is still full of matches. This is done with the one hand only, the other falling carelessly on the matches, getting possession of a score or so of them, which he holds against the palm by the pressure of the thumb. The second lot of matches is now shaken out upon the first, and again the box is closed. Once more the performer blows upon it, and, under cover of so doing, turns it upside down. When he opens it again, it is once more apparently full, the matches glued to the bottom of the drawer being now brought into view. Transferring it to the opposite hand, he gives it a shake, allowing the matches concealed in that hand to fall from it as if out of the box, then again turning it, so as to bring the empty side of the drawer uppermost.

"Now," he says, "you can all testify that these matches came out of this box. To show there is no deception, we will try how many we can put back again." He fills the box, but there is still an equal number left over. These he presents to the company.

A RAILWAY TRAIN BUILT UP FROM SQUARES

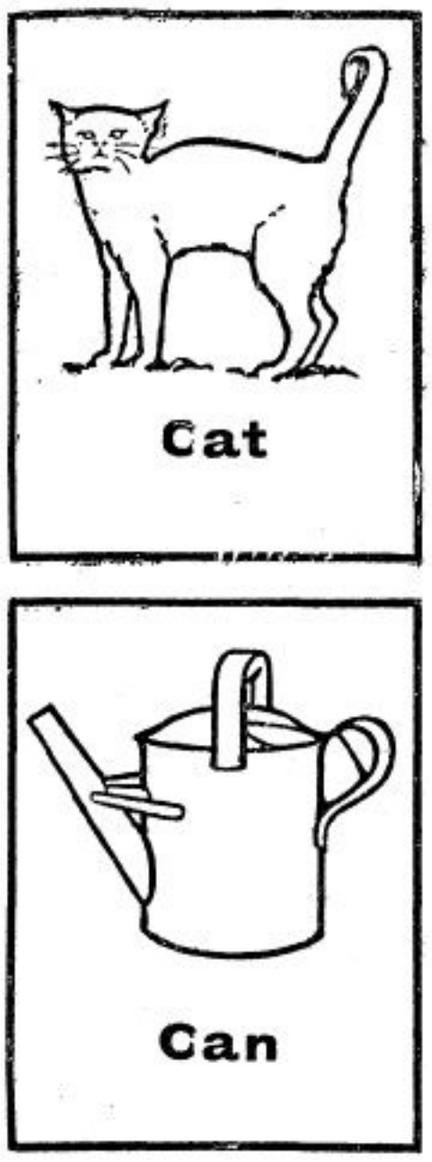


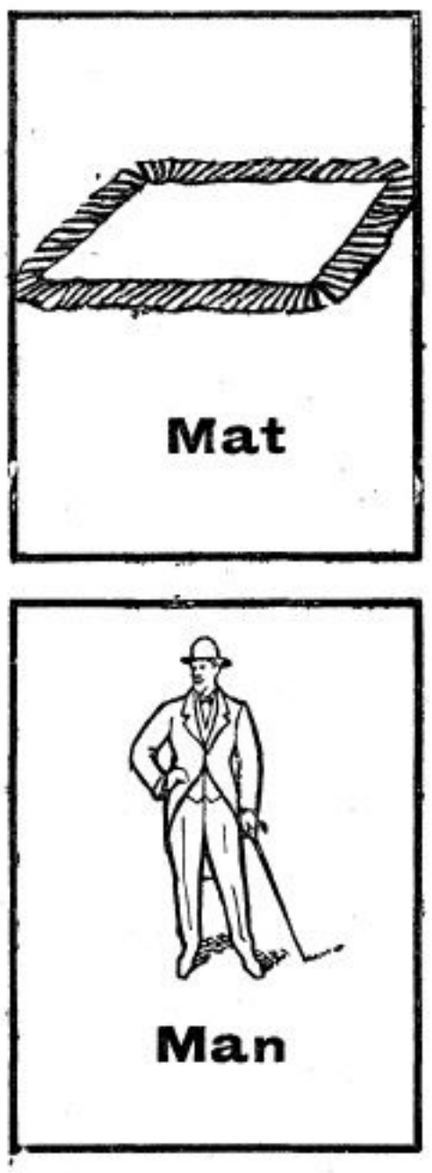
Here is a train which can be built up from squares. The little sketches below show how to start building with the squares as the foundation.

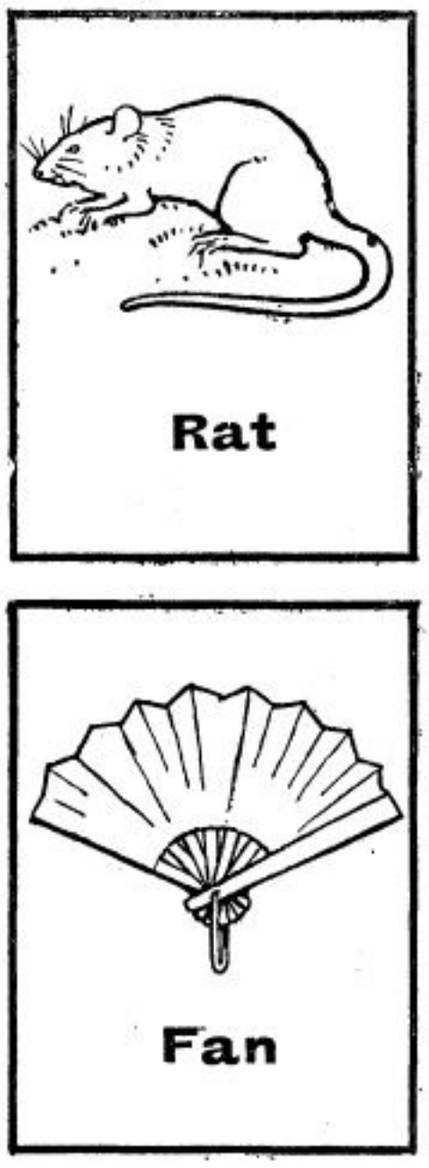
Simple Learning Made Easy for Very Little People

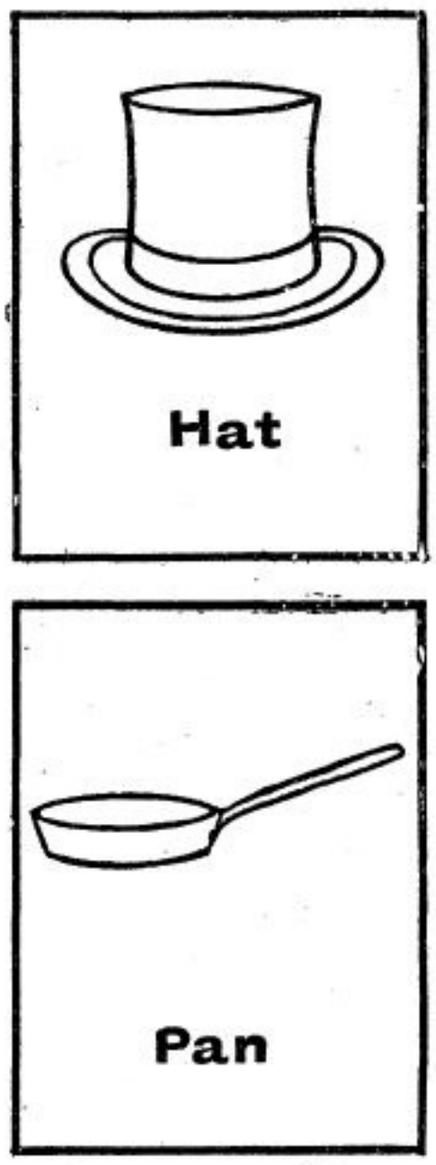
READING—MAKING OUR OWN PICTURES

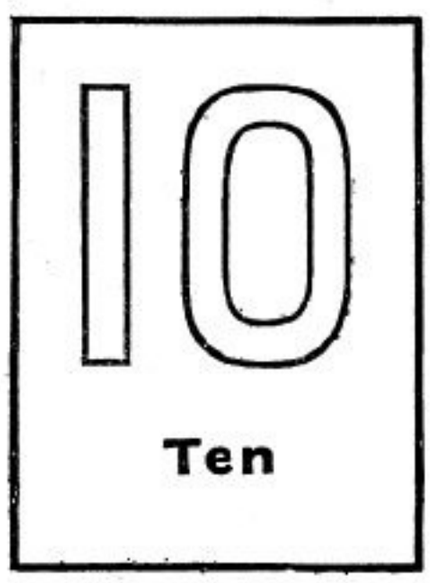
NEXT day Mother said: We can't go on buying boxes of blocks, and, besides, the toyshop people nearly always put the same pictures in their boxes, and they are not always very in-ter-est-ing. Let us make our own pictures now. Let us draw some that are very easy to draw, and have easy names, and names that sound a little like each other. Just a few will do. You can draw and learn all these pictures and words by yourselves, because the pictures tell you clearly what the words are.

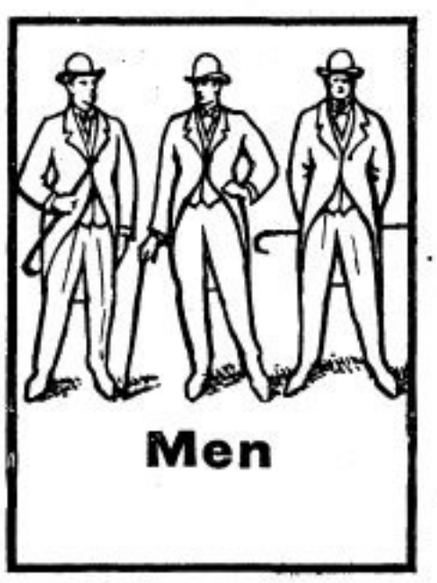


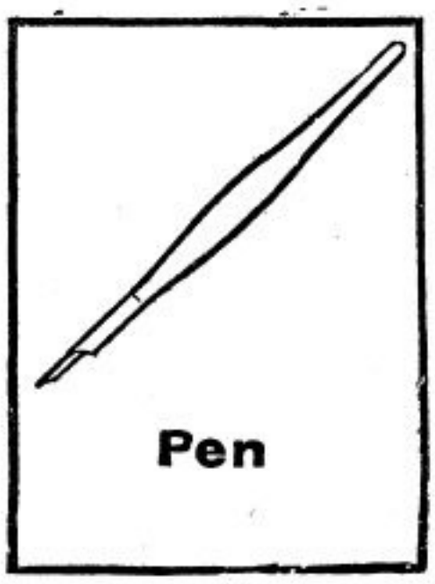


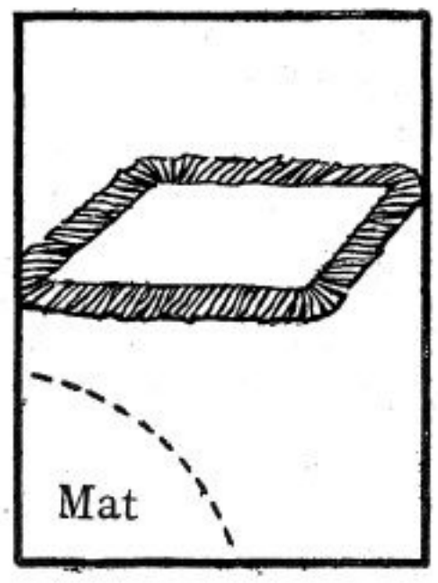


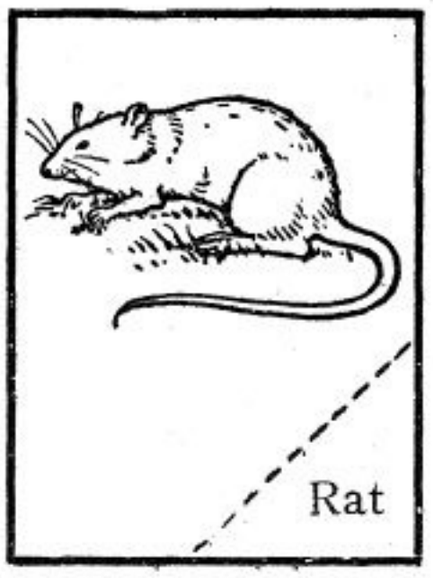


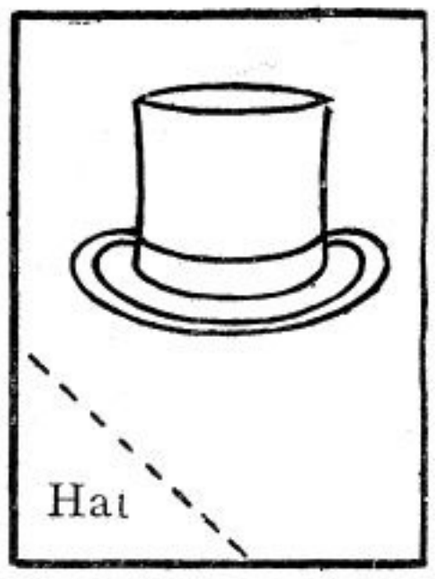


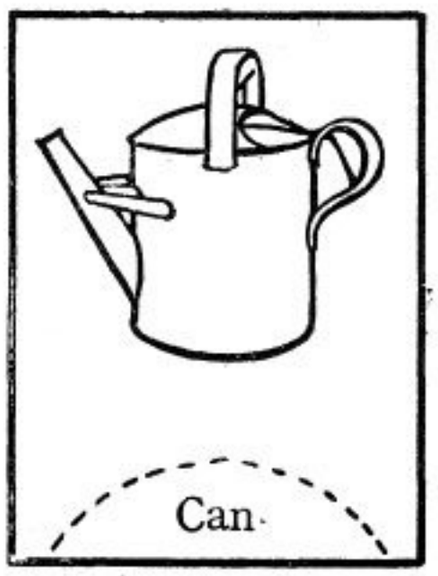


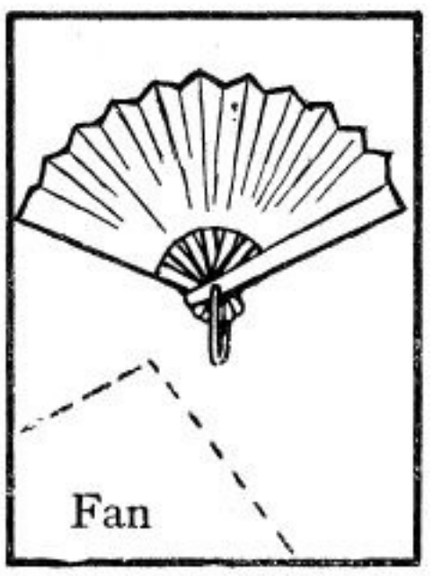


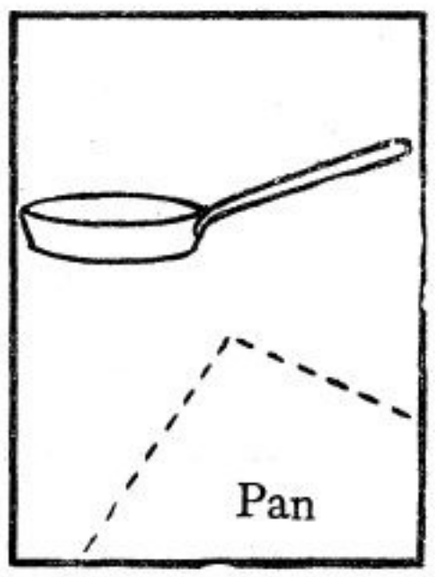


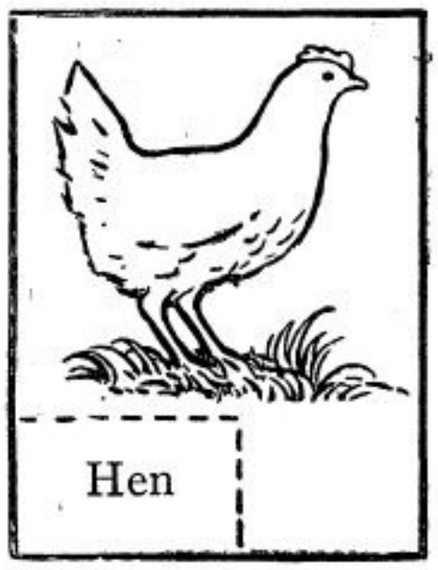


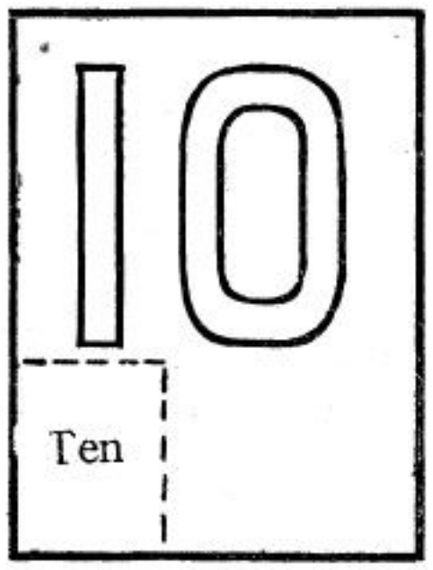


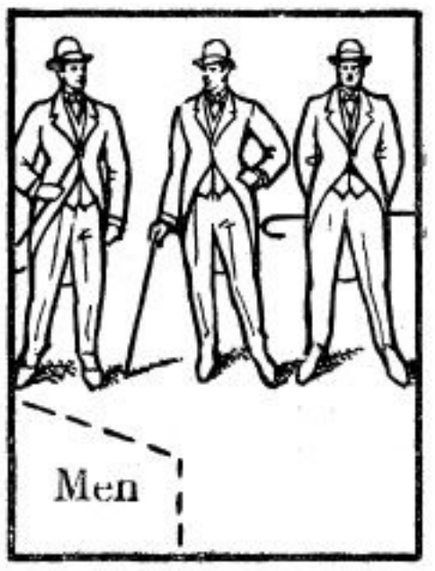


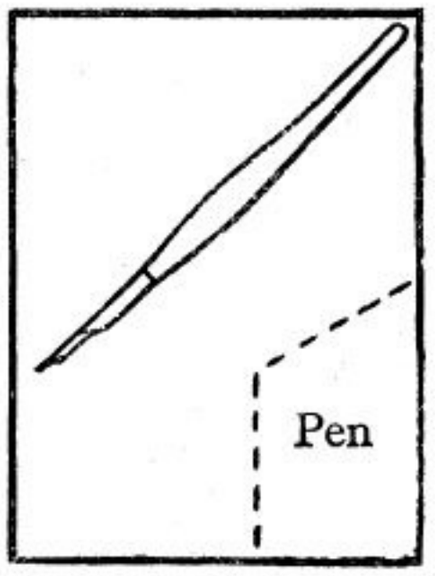












By and by we will cut off the words and mix them up, and see if you can put them up to the right pictures again.

When Daddy came home he found them trying very hard, but they could not do every one quite right, so he said he knew a jolly way to help them. He was going to make some little jigsaw puzzles.

The twins thought that would be splendid.

So Daddy got some thick cards and made some nice little puzzles like those in the picture at the top of the page. The real ones were longer than these, of course.

They were pink cards and kept in one box, and the twins liked them so much that Daddy made them a few more on blue cards.

Of course he had to put a different word on each pink one, or else the twins might put the wrong word to the picture; but with the blue tickets he could use all the same words again.

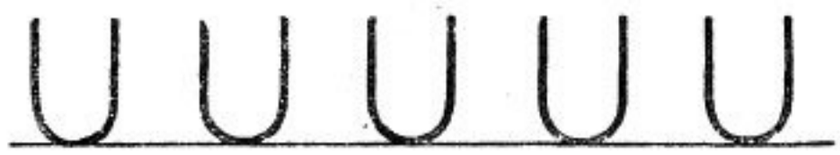
One nice game Betty thought out It was a Snap game.

She said, Let us put out our pictures and words on the table upside down and then play Snap. I will turn a picture up, and then you and I will pick up the words until we come to the right one. The one who says Snap! first will keep it.

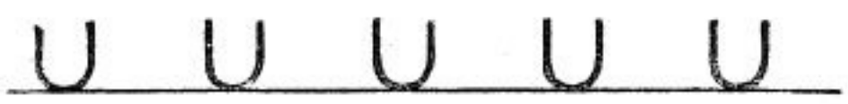
That was great fun, and they made a lot of little words and pictures all by themselves to play with.

WRITING—THE REST OF THE LETTERS

THE next letter the twins learned
It was the letter U .
U's are like two deep basins,
Make them well without any fuss.

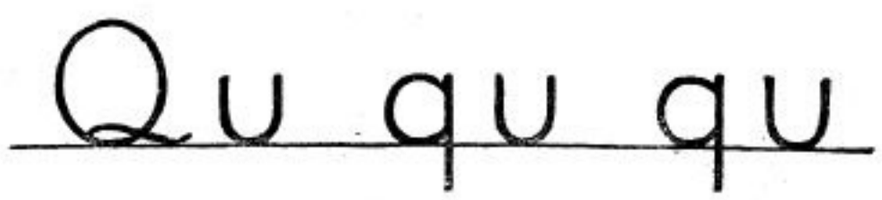


U for Uncle and Union Jack,
u for up and u for us.



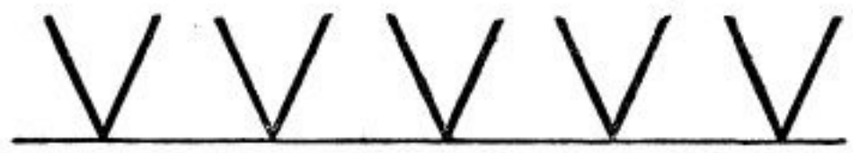
It's a funny thing, but very true,
That after Q there comes a u.

Qu for Queen Mary and girls called
Queenie,
qu for queuing in a queue.



Now we will make the last five letters of all, one after the other.

V's are like hills turned upside down.
Write them both as well as you can.

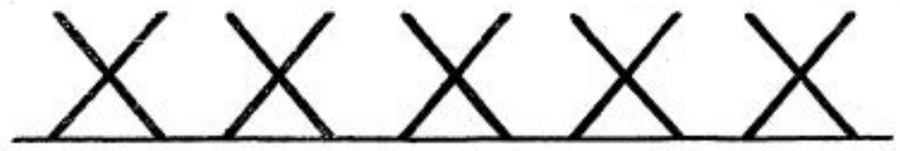


V for Victor and Violet, too,
v for vinegar, vat, and van.

W looks like double V,
But "double-u" its name
must be.

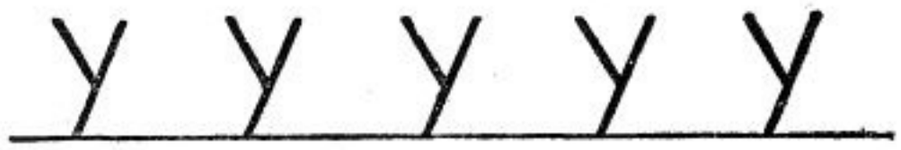
W stands for Wee Willie Winkie.
The little one stands for winkle.

Two nice strokes across each other
Make the letter we call Mr. X.

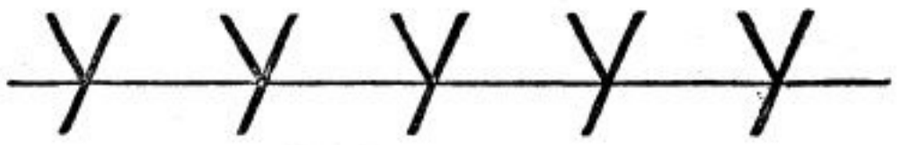


He won't begin a word for us,
But he comes at the end of ox and
vex.

X looks like a kiss,
And sounds like a kiss.



Y for Yankee-Doodle-O
y for yolk and yellow-ow.
Stand V up on slanting I
So we get the little y.



Capital Z and little z
Are something like a zigzag.

Capital Z we use for Zoo,
And small z stands for zigzag.

Now for two little verses to end up
our lesson today.

We've found a story from A to Z,
Keep them in your little head.
Put some sugar on your bread,
Eat it up and go to bed.

A E I O U

These have other sounds for you.
And why do they have so many
more?
Because of the letters that live next
door.

These are very special letters; we shall hear about them another time.

COUNTING—A TALK ABOUT FOUR

Now, what can you tell me about four? Mother said next day. Look round the room and see what fours you can see.

Betty and Billy could see lots of fours : 4 legs on the table.
4 legs on each chair.
4 legs on Pussy, and 4 on Fido.
4 corners on each picture.

Then Daddy came home and asked more questions.

A cat and a box. How many legs? A boy and a hen. How many legs? A millboard and a ball. How many corners?

Betty had 4 sweets. Billy had 3 and 1. Mother had 2 and 2. Who had the most?

Two twins. How many eyes? How many hands? Legs? Mouths? Noses? Two pairs of twins. How many children?

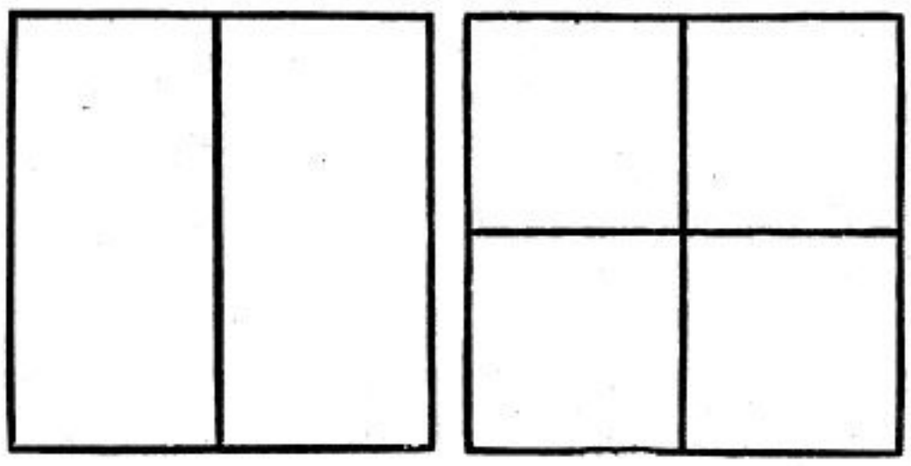
Four is a nice number, isn't it? said Mother. And while we are learning it I think it will be nice to learn something else.

Here are some nice squares of coloured paper. Let us take one each and fold it in two. That will be two *halves*. That is, a half of a whole thing—like Billy eating half a bun or half of a big apple. (Billy looked at Betty, and Betty looked at Billy, but they didn't say anything.)

Now let us halve some numbers. 4 apples. Half eaten. How many are left?

2 buns. Billy ate 1. How many are left?

Now let us fold our paper into 4 parts, like a doll's handkerchief. If I cut out one part, what shall we call it? A quarter.



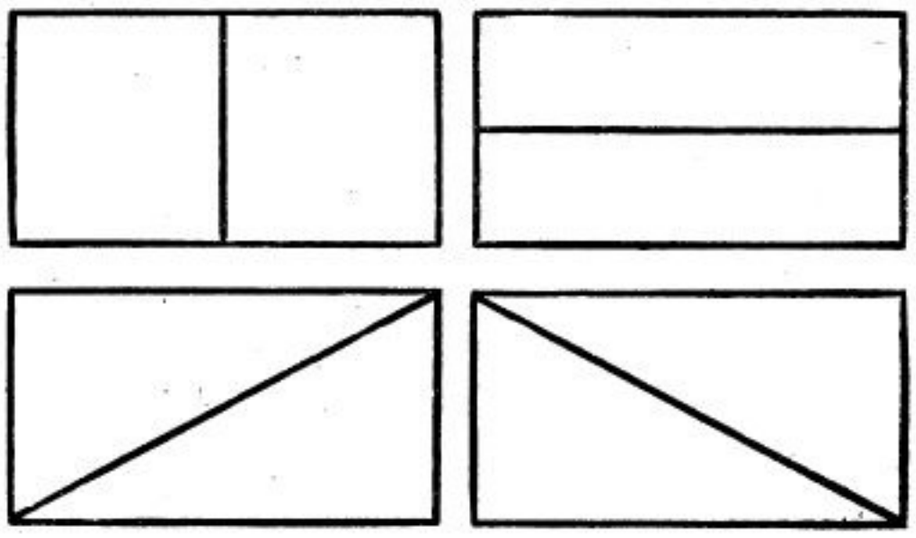
How many halfpennies make a penny? 2. So halfpenny means half-a-penny. How many farthings make a penny? 4. So a farthing is a quarter of a penny.

How many farthing buns can I buy for a penny?

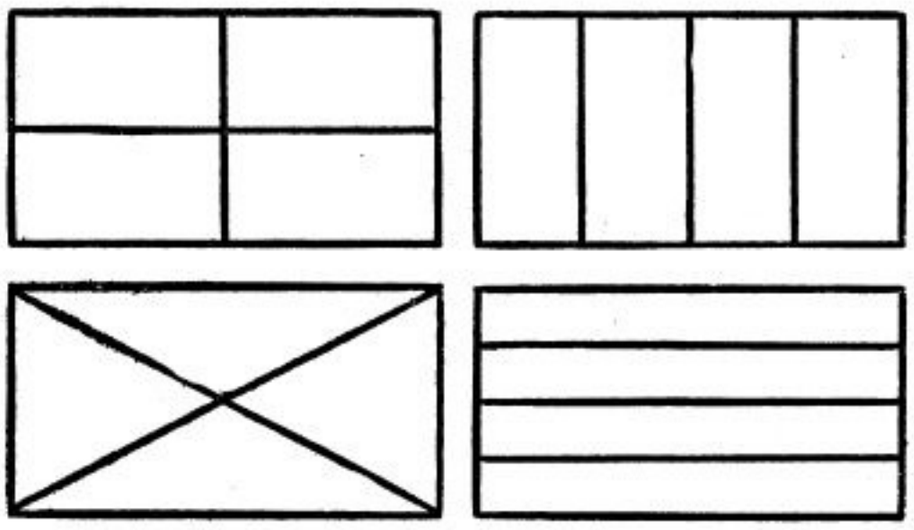
If Nelly and Jenny come to tea, how many cakes must I buy for you all to have 1 each?

If Betty has a penny, and Billy 2 halfpennies, and Mother 4 farthings, who has the most?

Now let us "cut" our boards into halves, and then into quarters, and let us see in how many ways we can do it.



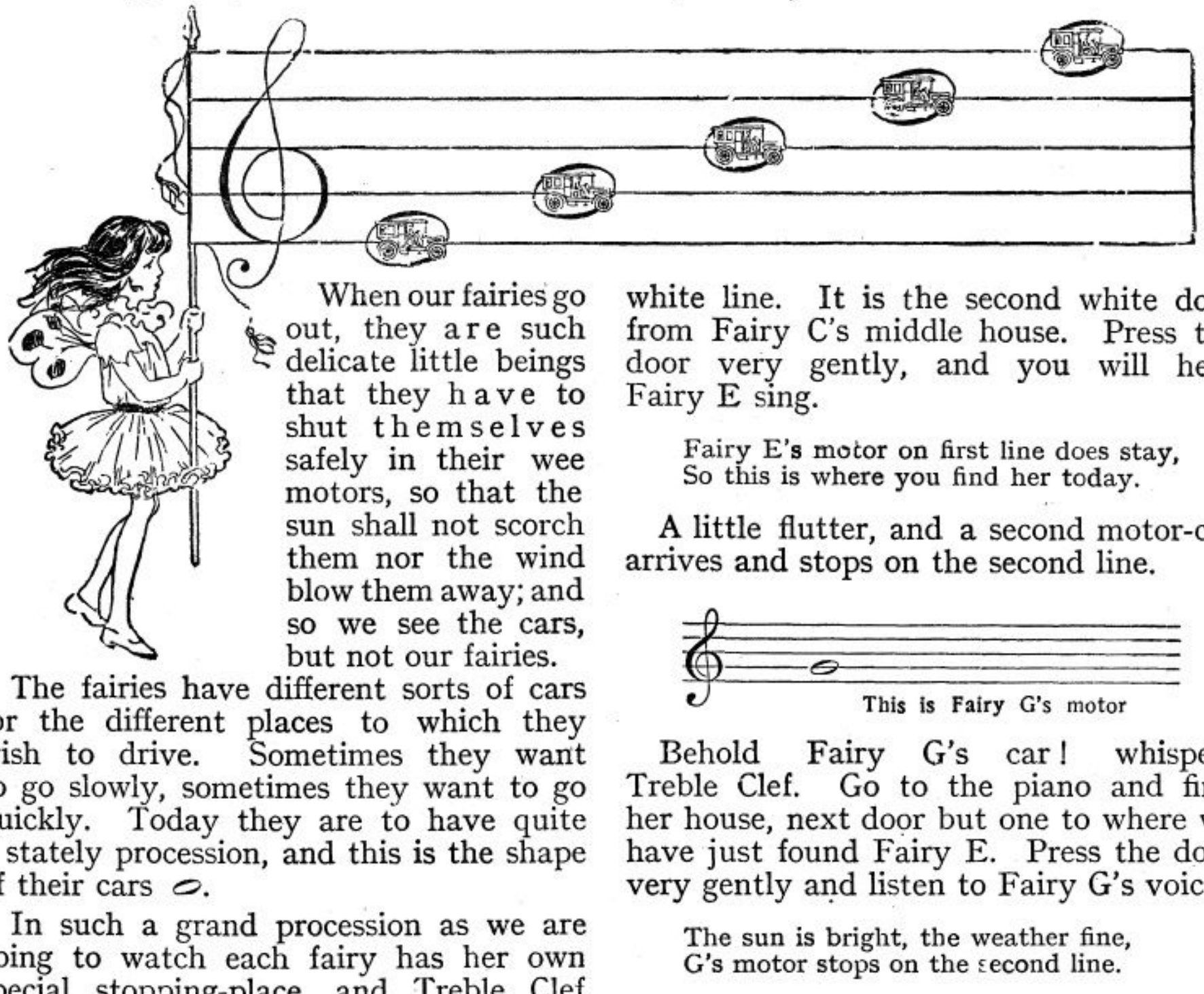
Now cut it into quarters.



There are more ways, but these will be enough for you now.

MUSIC—THE PROCESSION IN THE TREBLE CLEF

OUR little fairy guide, Treble Clef, has a very busy day before her. The fairies are going to have a procession. They are coming in their little motor-cars down the Treble Road, and Treble Clef, holding her flag, is to stand at the entrance to her road and tell us just what is happening there.



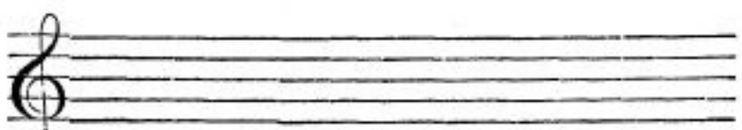
When our fairies go out, they are such delicate little beings that they have to shut themselves safely in their wee motors, so that the sun shall not scorch them nor the wind blow them away; and so we see the cars, but not our fairies.

The fairies have different sorts of cars for the different places to which they wish to drive. Sometimes they want to go slowly, sometimes they want to go quickly. Today they are to have quite a stately procession, and this is the shape of their cars ○.

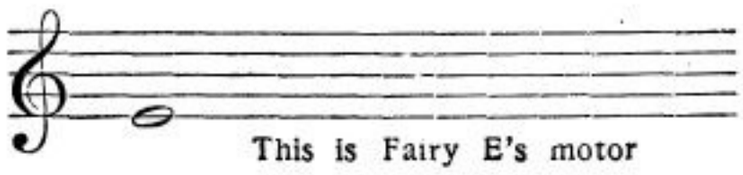
In such a grand procession as we are going to watch each fairy has her own special stopping-place, and Treble Clef will name each fairy as she drives up in her pretty little motor. We shall see where each one stops. We found there were five motor-lines, which the fairies call a *stave*, and these are the lines our fairies are using today.

There is a little movement—quite a gentle stir, for fairies tread daintily—and Treble Clef is in her place.

Hark! A gentle, buzzing noise like the whirr of insects' wings tells us the first fairy car has arrived.



Treble Road



This is Fairy E's motor

Treble Clef cannot talk loudly to us now because she is on duty; but in a whisper she says, This is Fairy E's car.

She tells us that Fairy E is inside, and now she has stopped on the first motor-line. We must go to the piano and find that house of hers which is very near the middle of the black and white line. It is the second white door from Fairy C's middle house. Press the door very gently, and you will hear Fairy E sing.

Fairy E's motor on first line does stay,
So this is where you find her today.

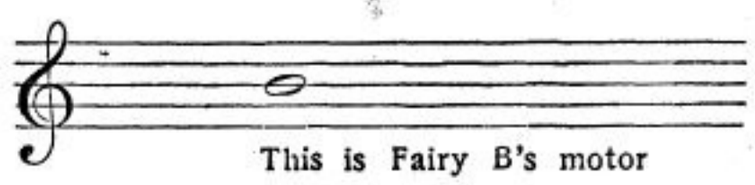
A little flutter, and a second motor-car arrives and stops on the second line.

This is Fairy G's motor

Behold Fairy G's car! whispers Treble Clef. Go to the piano and find her house, next door but one to where we have just found Fairy E. Press the door very gently and listen to Fairy G's voice:

The sun is bright, the weather fine,
G's motor stops on the second line.

Still another rustle, like a murmuring breeze, and Fairy B's car arrives. She goes on till she reaches the third line.



This is Fairy B's motor

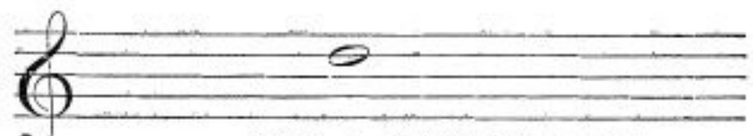
Treble Clef tells us to go to the piano and find Fairy B's house, next door but one to Fairy G. Press this door and hear Fairy B answer.

'Tis quite the right door; how clever you are!
On line number three stops Fairy B's car.

Tinkle, tinkle, tinkle! Another fairy has arrived.

Fairy D is coming to take her place on the fourth line, says Treble Clef in her gentle whisper.

Off we run to the piano and find Fairy D's house, the next door but one to where we heard Fairy B speak. Directly we press the door Fairy D sings :

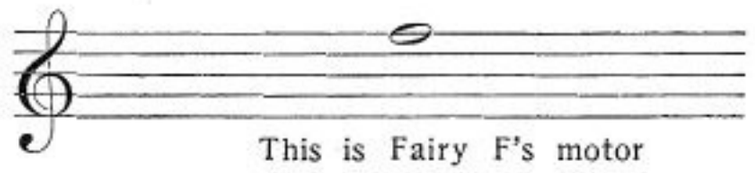
When Fairy D's coach stops at line number four,
You may rest content that this is her door.

This is Fairy D's motor

Again there is a rustle, gentle as a butterfly's kiss, and Treble Clef's voice again is heard.

Here comes Fairy F's motor, to take her place on the fifth line she says.

Once more we must go to the piano, find Fairy F's house, the next door but one to where we have just found Fairy D, and, pressing the door very gently, we hear Fairy F's sweet song :

In the wide, wide world I never need roam,
For line number five is Fairy F's home.



This is Fairy F's motor

Next time we shall hear about the fairy meeting on the Bass Road.

DRAWING—HOW TO DRAW A JAM JAR

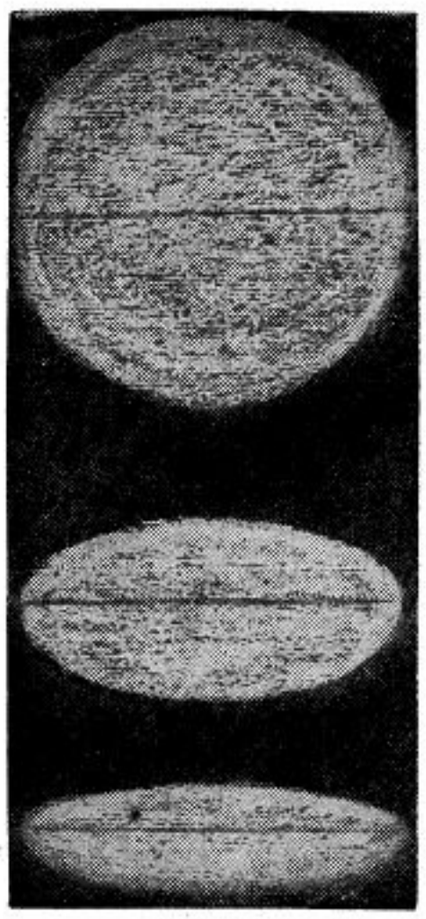
TODAY we are going to draw a jam jar, but before we begin we shall want a penny. When you have it, put it on the back of your hand, laying the hand flat on the table. The penny looks quite round, does it not ? Raise your hand slowly till it is level with your eyes, and notice that the penny seems to get narrower and narrower, till at last you can see only the edge, and neither the one side nor the other. If your hand were made of glass, and you raised it still higher, you would see the underneath side of the penny through it, and it would look wider and wider, till at last, when it was right above your eye, it would look quite round again. And so we see how things seem to alter in shape as we move them about. Quite big things look tiny if we see them at a distance.

Now we must get our drawing things. We want two sheets of brown paper, one sheet of white paper, a pair of scissors, some white and some black chalk, and a clean white jam jar. Pin a sheet of brown paper on your board, put the white jar on the white paper, and draw round it with a piece of black chalk very carefully, so as to make a circle on the paper.

Cut this circle out with the scissors, draw a black line across the middle of it, and put it on the other sheet of brown paper in front of you, and move the sheet gradually farther and farther away. You will see that it looks narrower and narrower. By putting the black line across you get two semicircles ; the one farthest away looks narrower than the other. Keep the white circle still on the paper, and hold the paper at each side, and raise it gradually to the level of your eye. You will see that it seems to get narrower, as the penny did, till it looks only like a white line.

Get someone to hold the sheet of paper and raise it for you. It is better held a little way off. Practise drawing the ovals by themselves, using the side of the white chalk and rubbing it on the brown paper. Make the best circle you can, and then do different widths of ovals.

When you have practised these a little, pin the other sheet of brown paper on the board, and put the jar a little way off in front of you on the table. You can see inside it because it is *below* the eye. Can you see a dark shadow and a white light ? Put the shadow in with black chalk, then use whitechalk thinly, and then white chalk thickly, as you see in the picture, till you have made the oval the proper shape ; it should be more curved in front than at the back. Now make the lightest side with white chalk, the darkest side with black chalk, and join them by using white chalk thinly.



Notice the curve at the bottom. Is it rounder than the top curve or less round ? Rounder, of course ; the curves get *less* round the nearer they are to the level of the eye. You never see the top of the jar quite round unless it is underneath your eye. A wasp sees it quite round, when he is flying downward into it to look for jam ; but when he is crawling toward it on the table he cannot see inside it at all, it is above his eye.

FRENCH—A RIDE IN THE TRAIN

HERE we read how our little party spent their time in the train. We must be sure to remember that the first line under the picture is the French; the second gives the English word for the French word above it; the third line shows how we make up the words in our own language.

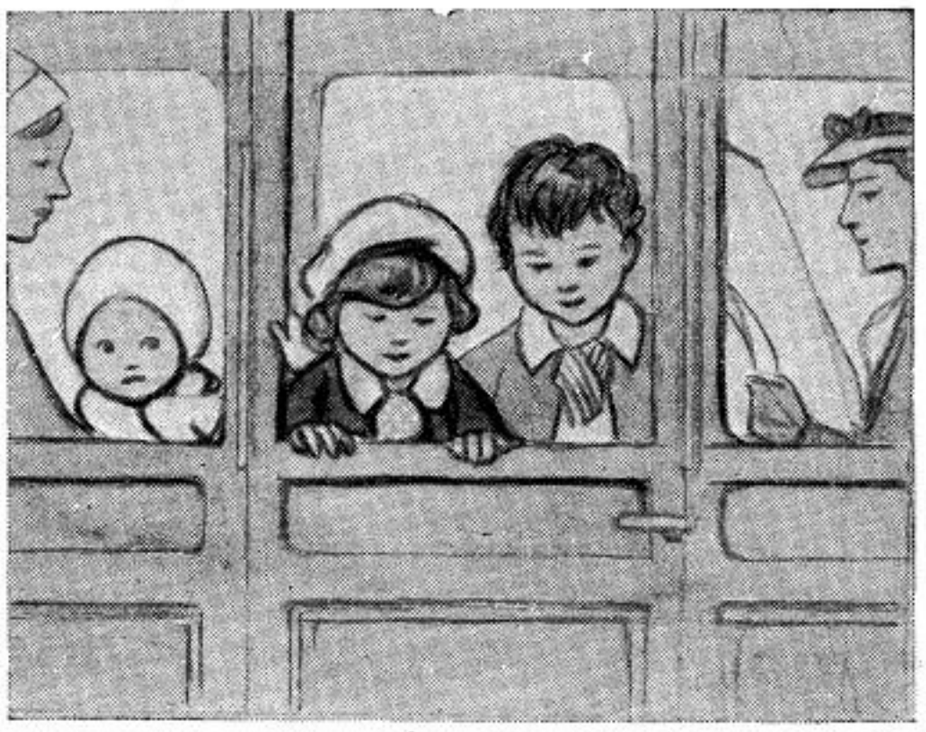
Nous montons dans le compartiment
We mount in the compartment
We get in the compartment

On crie : " En voiture ! "
Someone calls : " In carriage ! "
Someone calls : " Take your seats ! "

Un monsieur court—A gentleman runs

Un monsieur court de toutes ses forces
A gentleman runs with all his might
A gentleman is running with all his might

Il manque de tomber. Que c'est drôle !
He misses to fall. How it is funny !
He nearly falls. How funny it is !

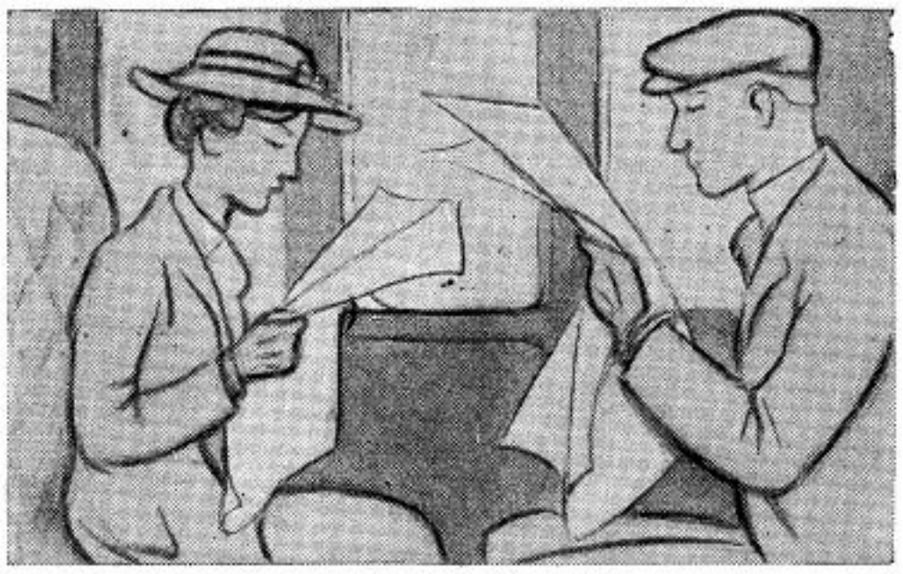


La portière—The door

Maman nous installe, chacun dans un coin
Mamma us settles, each in a corner
Mamma settles us, each in a corner

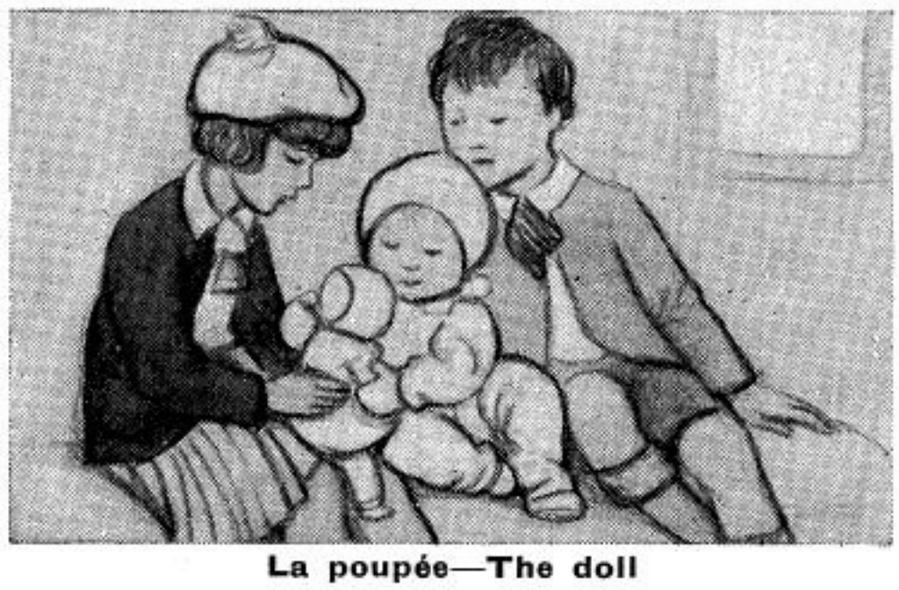
On ferme les portières
Someone shuts the doors
The doors are shut

Le train part. Nous sommes en route !
The train starts. We are on way !
The train starts. We are on the way !



Papa et maman—Papa and Mamma

Papa et maman lisent les journaux
Papa and Mamma read the papers
Papa and Mamma are reading their papers



La poupée—The doll

Nous jouons à la poupée
We play at the doll
We play with the doll

Je suis le papa. Jeannette est la maman
I am the Papa. Jenny is the Mamma
I am Papa. Jenny is Mamma

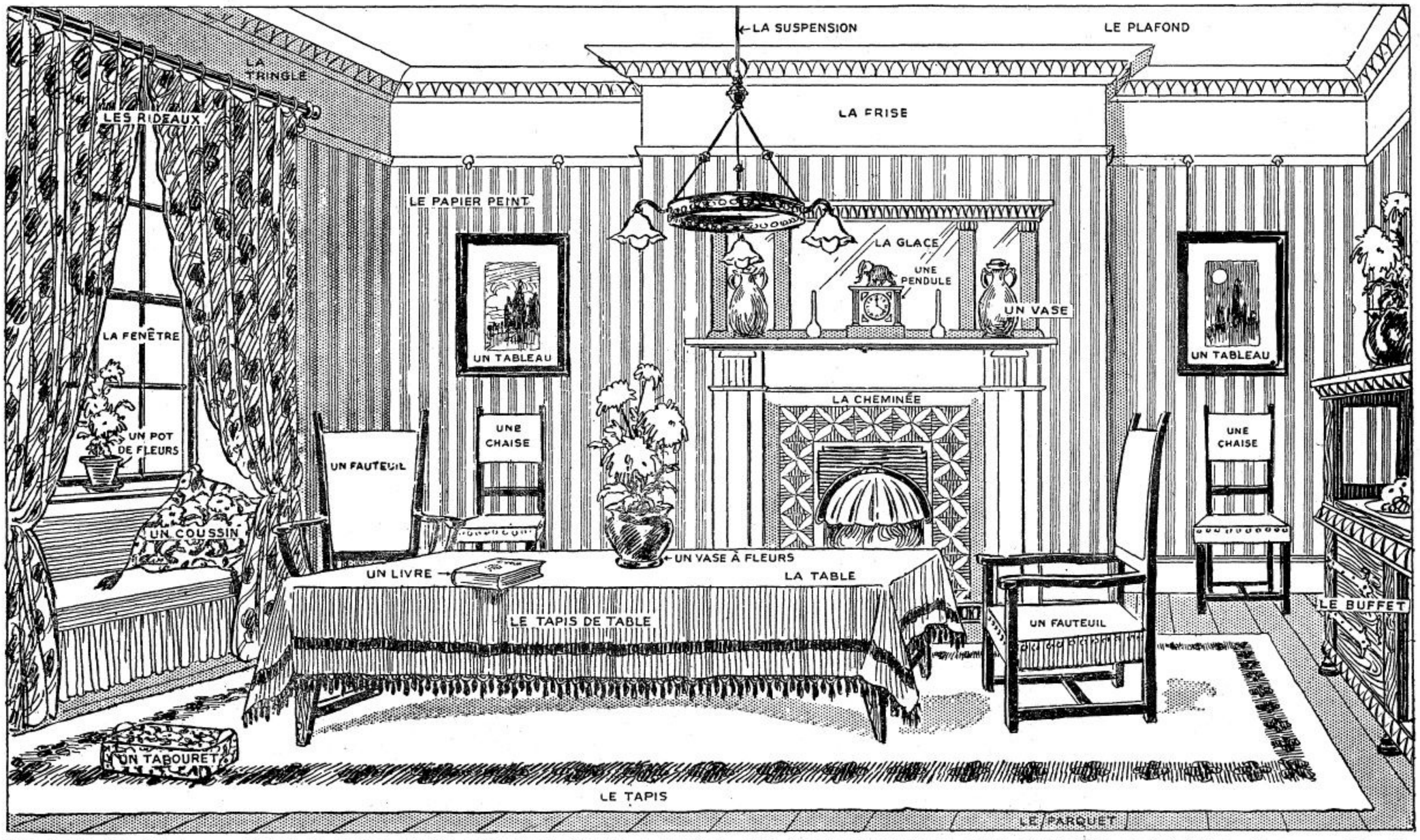
Bébé et la poupée sont nos enfants
Baby and the doll are our children
Baby and the doll are our children

Nous les aimons beaucoup
We them love very much
We love them very much

Bébé pleure—Baby cries

Bébé pleure et fait le méchant
Baby cries and makes the naughty child
Baby cries and is tiresome

A FRENCH PICTURE LESSON: NAMES OF FAMILIAR THINGS IN A DINING-ROOM



This picture of a dining-room will help us to learn the French for the familiar things around us. The objects named are the ceiling, electric-light pendant, frieze, wall-paper, curtain-pole, curtains, looking-glass, clock, vase, fireplace, picture, chair, armchair, window, flower-pot, cushion, table, table-cloth, book, flower-vase, sideboard, footstool, carpet, and flooring.

The Story of the Boundless Universe and All its Wondrous Worlds

Molten lava from the Earth's interior pours forth from the crater of Kilauea

HOW FIRE & WATER MADE THE WORLD

The hills are shadows, and they flow
From form to form, and nothing stands;
They melt like mist, the solid lands,
Like clouds they shape themselves and go.

WE have seen that the Earth blossomed, as it were, from the Sun, and grew into a huge hot ball denser than steel, with a wonderful substance called radium in its crust to keep it warm.

Many people think that when it first hardened it was probably pear-shaped, and even today, if we were to remove the seas, the Earth would roughly resemble a pear, or peg-top; at least it would have a bigger rounded end at the North Pole and a smaller more pointed end at the South Pole. But the early pear-shaped Earth had still much smelting and forging to go through.

When ore is melted in a furnace the stony materials rise to the top, forming slag such as we see heaped round iron foundries, and the metals collect in the lower part of the furnace. In the mighty fiery furnace of the blazing Earth the same sort of separation occurred, so that it grew to have a core of iron and other heavy metals surrounded by a crust of slag. Nobody has ever dug right through the slag, now in the form of mudrock, to the metal core, but it is believed to be about 45 to 75 miles thick. Indeed some geologists think that between the solid slag-mud and the metal core there is a layer of molten slag which has not yet solidified. The slag consisted chiefly of two beautiful rocks —granite and basalt; and it is these two rocks which have made the Earth the home of life. If the Earth had been composed wholly of metal it would have made a giant cannon-ball; but it could never have become a world of living things. The granite and the basalt slag contained iron, magnesium, silicon, phosphorus, lime, sodium, and potassium; indeed, all the elements necessary for life—even water and the gases carbon dioxide and nitrogen. That is surely a marvellous thing—that the stuff of the whirling fiery furnace of the Earth should have contained *exactly the things necessary for life!*

But granite and basalt are hard rocks; and Life at that stage might have complained: "I asked for bread, and you give me a stone." In that stage the crust was not even a crust of bread. Yet the elements of life were there; the rocks had been made, and now they had only to be ground down into soil. So the great mills of God began to grind; and

Though the mills of God grind slowly,
Yet they grind exceeding small.

They ground the granite and the basalt into mud and dust.

As the hot slag cooled down it contracted and puckered up into mountain ranges, or was torn asunder, leaving great cracks through which poured rivers and seas of steam and lava; and everywhere volcanoes flung hot ashes and gases to the sky, and filled the heavens with dust and clouds. Probably the gas from the torn and twisted crust grew to be the atmosphere, and almost certainly the steam from earthquake cracks and volcanoes grew to be the water of the world. The steam condensed on the top of high mountains and became rivers and seas; and the air and the water began their great work of wearing down the granite and basalt mountains.

Millions of years they worked away, while the volcanoes steamed and the earthquakes thundered, and the tortured crust was twisted and torn; and during these years of mountain-making and rock grinding the whole geography of the crust was ever changing, so that great mountain ranges rose out of the sea, and the floors of seas became dry land.

MOUNT EVEREST RISES FROM THE WHALES AND VISITS THE EAGLES

At one time the Himalaya mountains were at the bottom of the sea, and were slowly lifted out of it—"once with the whales, now with the eagle skies"—and at one time there was almost certainly a great continent in the middle of the Atlantic Ocean. Some of the rocks and mountains of the world are composed almost entirely of sea-shells, great and small. "The white cliffs of Dover" are built up of such shells which collected on an ocean floor, and some of the limestone rock in the state of New York contains as many as 40,000 tiny shells in each cubic inch. And all this lime had been worn off granite and basalt mountains by rain, washed into the sea, and collected by the little living creatures there! The Dolomites in the Tyrol are actually made of coral, that is to say of lime and magnesium collected from the sea by coral-making creatures, and originally basalt slag and granite slag worn down by rain and rivers. Well did Tennyson write:

> There rolls the deep where grew the tree.
> O Earth, what changes hast thou seen!
> There where the long street roars hath been
> The stillness of the central sea.

Yes, not so very long ago, as we count time in geology, Regent Street, Oxford Street, and Hyde Park were deep under salt water; and only in a few little areas in the British Isles are there any bits of rock that have not at one time been mud in the bottom of the sea.

It is extremely difficult to know how land and sea were arranged ages ago, but it is quite certain that there have been tremendous changes. At one time, as we said, the Himalayas and the Dolomites were at the bottom of the sea, and that is the history also of the Alps, and of practically all the mountains except volcanoes.

THE VOLCANOES THAT BURST THROUGH THE NEW CHALK FLOOR OF BRITAIN

Not only is there reason to believe that at one time there was a continent in the middle of the Atlantic; but it seems likely that once we could have walked overland all the way fro[illegible]where New York is to where Australia is, and could have gone by boat all the way from where Stockholm is to where Pekin is. Anyhow, it is certain that only after tremendous changes, heavings, sinkings, crumplings, crackings, did the Earth reach its present form.

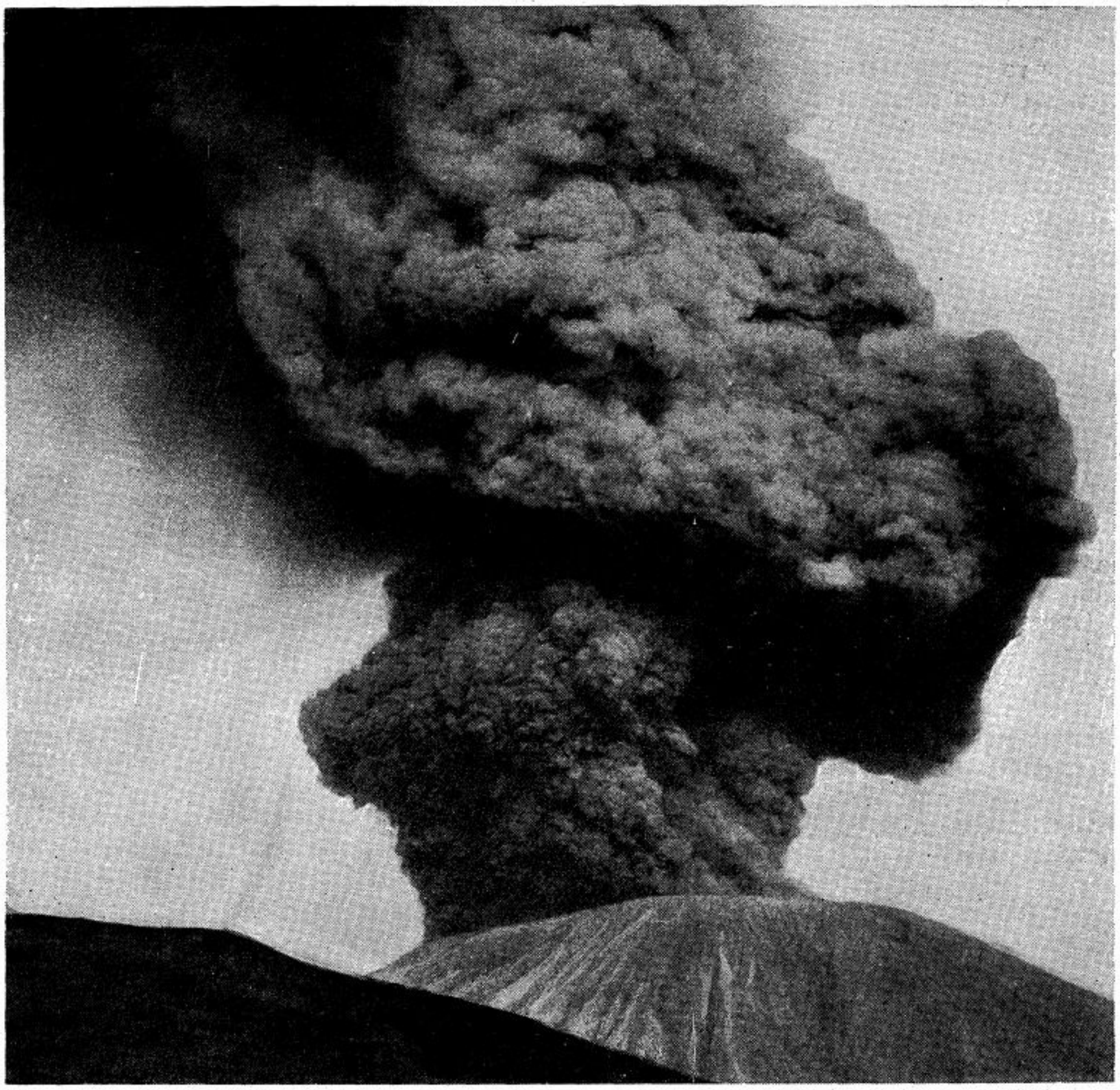
Even after the seas were formed we find evidences of tremendous eruptions. At one time, when Ireland and Britain had been raised from the sea as one great island of chalk, a tremendous volcano—or, it may be, several volcanoes, burst through its white floor and covered many thousand miles of the white chalk with molten lava a thousand feet deep. The remains of this lava outflow are still to be seen in the massive basalt columns of the Giant's Causeway, and at some time there must have been a basalt causeway all the way between Ireland and Scotland. But a still greater lava outflow took place in Iceland, coming forth like a deluge from a colossal crack, covering fifty thousand square miles, ten thousand feet deep, and uniting Iceland with the Faroe Islands, the Hebrides, Ireland, and Scotland in one huge island.

THE MILLS OF GOD GRIND ON, AND THE RIVERS WASH AWAY THE EARTH

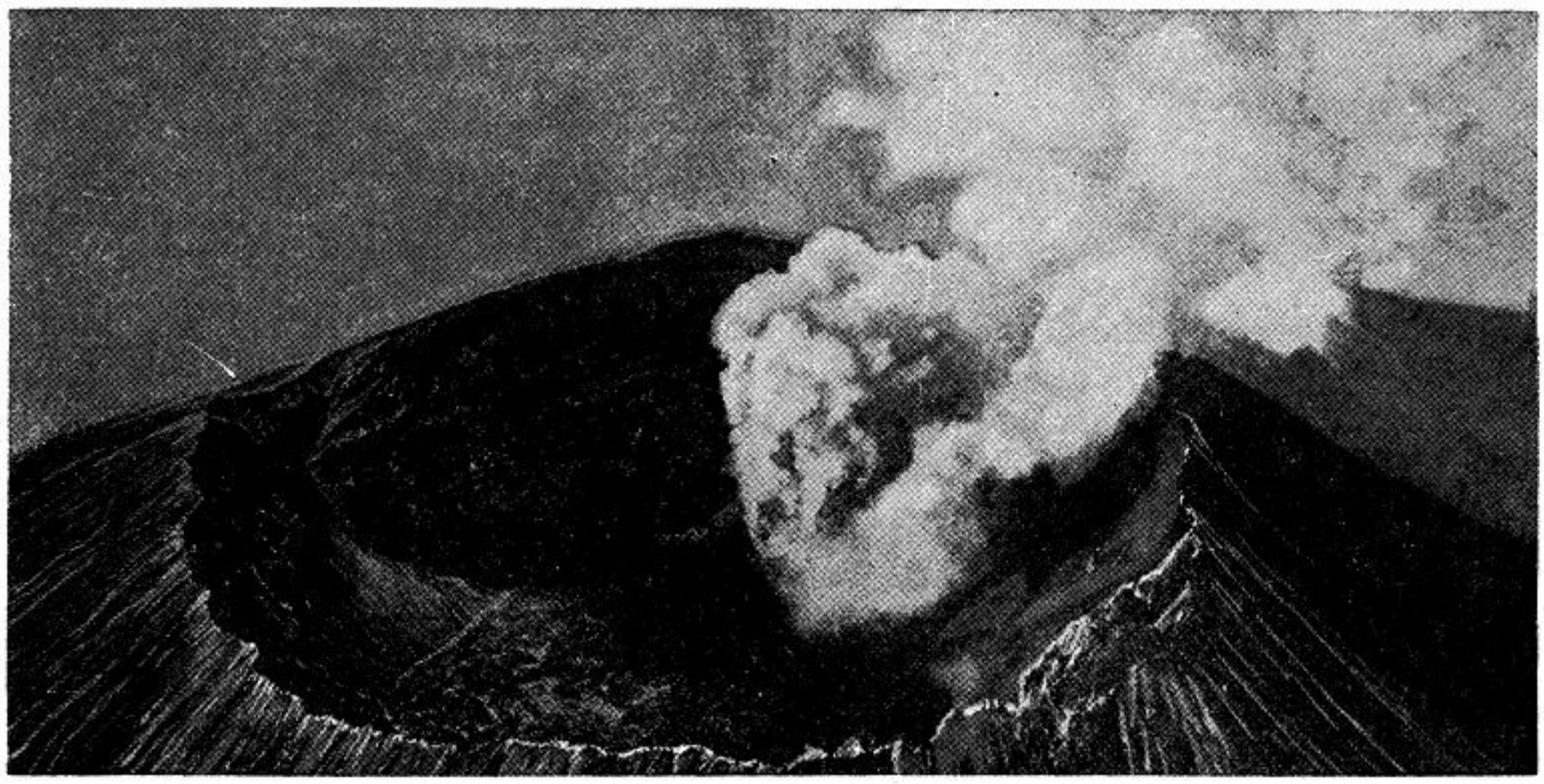
In later years, when the Earth's crust was harder and more stable, such tremendous eruptions did not occur; and the changes on its surface were less violent; but changes continued; fire, water, frost, wind, glacier, and animal life all worked unceasingly, shaping and re-shaping the surface of the world.

As we now know it, Earth seems a finished planet. It has mountains and

FIRES OF THE EARTH BREAKING THROUGH



EUROPE'S GREAT VOLCANO—VESUVIUS WHICH DESTROYED POMPEII AND IS STILL ACTIVE



VESUVIUS SEEN IN ACTION FROM AN AEROPLANE

seas, and rivers and forests. Its granite and basalt have been ground down into soil for roses and trees and wheat, and it is teeming with plant and animal life. The furnace has wrought it into perhaps the most wonderful orb in the universe. But still the mills of God grind on. Still the rain and the rivers are ceaselessly washing the world into the sea. Still we can hear

> The sound of streams that fast or slow
> Draw down Aeonian hills and sow
> The dust of continents to be.

Still the waves are nibbling and gnawing at the coasts of islands and capes. Still the wind is wearing sandstone hills into sandy deserts. Still chalk cliffs and coral peaks and continents may be slowly rising from the depth of some ocean : even still some volcano yet unborn may overtop Chimborazo and Aconcagua.

Once more England may be submerged : once more men may walk dry-foot across the Atlantic. We live only a short time, and the mills of God grind on so slowly that in a human lifetime little change is to be seen on the face of the Earth ; but even in one lifetime we can watch the mountains "flow from form to form"; and the gradual sinking or rising of parts of the Earth's surface, the slow nibbling of the coasts by the breaking waves. Within the last fifty years volcanoes such as Krakatoa and Bandai San have been blown to pieces, and great earthquakes have occurred which have made new cracks in the Earth's slaggy crust. Our Earth is not yet dead ; it has still a hot heart ; and so long as there are water and wind, and a Sun to move them, it will go on changing. Some day, millions of years ahead, when the Sun is extinct, our planet may spin as a cold dead ball covered with frozen air ; but unless something unforeseen happens it has still a changeful life before it for millions of years to come.

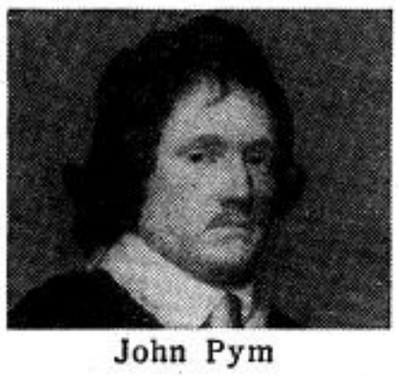
To what great goal all these changes are working we cannot tell ; we cannot see far enough. But as we spin through space we can study the changes and take interest in them, knowing that they are directed by the same far-seeing Wisdom that melted the world in a furnace, and brought forth the magic slag which grew into the wonderful world of plants and animals.

It may seem to us that the Earth could not be much better than it is : we and the plants have just the right gases —oxygen and carbon dioxide—which we need for life. With less oxygen and more carbon dioxide we could not flourish so well, and might die. The plants, too, have just the right food in air and water to make food for themselves and for us. We even find coal ready for our use prepared by the sun-beams and forests millions of years ago ; and we find iron and salt and other useful elements all collected together in places, so that we can get them without too much labour. Beauty, too, we find everywhere —flowers and trees and blue skies, and rivers and seas and mountains.

Altogether it seems a very perfect and wonderful world, with all things fitting like the wheels of a watch, and we may find it difficult to believe that further change will bring forth yet more wondrous things. But all the changes through all the past, spread over millions of years, have led upward and onward. The beautiful blazing Earth cooled down till its outside was slag and mud and dust ; but it died to live again, and we who can look back through the ages, and see the blossoming of life, can still believe that the future holds beauty and wonder surpassing even the beauty and wonder of the marvellous Past.

THE MOUNTAIN RANGES FORMED BY THE CRUMPLING UP OF THE EARTH AS IT COOLED

The ranges shown in these pictures were all formed by the wrinkling and folding of the Earth's crust ; and they are formed mainly of mud accumulated at the bottom of the sea, though in many cases—as in the case of the Andes—volcanoes broke through the folds and increased the height of the general range.


John Pym

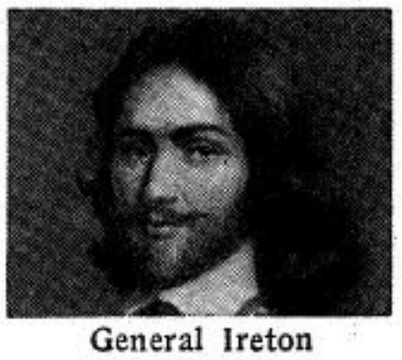
Thomas, Lord Fairfax

Prince Rupert

Admiral Blake

John Hampden

Sir John Eliot


General Ireton

John Bradshaw

CROMWELL AND HIS MEN

THERE was a great painter called Van Dyck, who made many portraits of King Charles. If you have ever seen one of them, it is easy for you to understand why, with all his faults and his follies, he was loved with a passionate devotion, and how he still casts a spell over the minds of men.

There is a dignity, a majesty, in the grave, delicate face, a charm in the haunting, melancholy eyes, a kingly air in the pose, which makes you feel that this was a man for whose sake many would die gladly. And yet we can see that it is not the face of a man wise in counsel or strong in action.

Now, if you look on the face of Cromwell, it is as though it had been hewn roughly out of solid granite, grim and massive and hard; there is power in every line, but of grace or graciousness no whit.. This man is a born fighter and a born leader. The other is born for defeat.

From his youth, Charles had evil counsellors. His father, King James the First, was a rickety-legged bigot, who was well described as "the wisest fool in Christendom." Never was a monarch so undignified as he; perhaps that is one reason why Charles bore himself always with such dignity. James gave the prince for a companion a young gentleman who was handsome, brave, proud, and worthless. Him he made a lord, and he became famous as the Duke of Buckingham.

Buckingham utterly won the heart of Charles, and taught him to think that princes and their favourites are altogether above the law. Moreover, it was due to Buckingham that Charles married the pretty French princess Henrietta Maria, who proved a counsellor fully as bad as Buckingham himself, after the duke had been slain by a crazed assassin. So that the two people whom Charles loved best in the world were the worst advisers he could have found, yet it was their advice he always followed.

But of all the ill counsel he got from these two, or from his father, the worst was their teaching that the word of a king may be lightly given and lightly broken. This, more than aught else, brought Charles to his final ruin. For, though the people were wroth with him before he signed the promises in the Petition of Right, they were far more angry afterward, because they felt he had played them false. Again, when he gave up Strafford to his doom all knew that he had broken his word; and when the

Parliament resolved to fight it was because they would not trust him. When, at last, Cromwell and his party resolved that the king must die, it was because they had lost all hope that he would keep his promises if he were allowed to live.

Yet Charles really believed he was in the right, except when he surrendered Strafford, for he held that the king is appointed by God, and should rule his people, not as the people think good for themselves, but as the king thinks good for them, and that, whether he rules ill or well, none can call him to account save the King of kings. Besides that, he saw that the Parliament was now demanding rights which it had never claimed before, and he thought that if he gave way there might remain to the king no power at all.

After the king had most openly broken the law by entering the House of Commons, seeking there to arrest the five men who were the chiefs of the party that opposed him, he went away from London, and there was little hope that war could be avoided. Some months later Charles unfurled his standard at Nottingham, and this was the beginning of the great Civil War.

OLIVER CROMWELL, THE MAN WHO WAS TO CONQUER THE KING

Let us see, now, what manner of life had been lived by the man who was to conquer the king. Oliver Cromwell had farmed his lands in Huntingdonshire, seeking to make no stir in the world. Once, indeed, he had come forward in his own part of the country as champion of the people's rights in the matter of certain lands of which they were being robbed, but for the rest he was known chiefly as a very religious man, who for his religion's sake had been willing to leave his own home and seek a new one in America. But he and his company were stayed by the king's orders when they were about to cross the sea.

In Parliament at first Cromwell was a rough, uncouth figure, unskilled and confused of speech, yet a man of mark by reason of his deadly earnestness.

When the war broke out and the tide of battle ran against the Parliament, it was Cromwell who saw how the tide must be turned. He saw that what made Rupert's soldiers so irresistible was the proud sense of honour which made them fear nothing but disgrace, and that these men must win unless they were fought by soldiers who for love of a great cause feared death as little as they.

Cromwell went down to the Eastern Counties, and gathered troops of men picked out for their zeal in religion, but also for their strength and valour and horsemanship. These men he trained in utter obedience, so that when they came to the shock of battle these Ironsides swept all before them, yet were ready to rally to their chief's command and hold back from needless pursuit and plunder.

THE BATTLE OF NASEBY AFTER WHICH CHARLES GAVE HIMSELF UP

So, at Marston Moor and Naseby under Cromwell aud Lord Fairfax the Ironsides smote the gallants whom none had been able to resist. But after the rout of Naseby the king's cause was lost, and Charles gave himself up to the Scots, who were in arms to aid the English Parliament; and after some time the Scots handed him over to the Parliament.

But now Cromwell and the soldiers grew ill content with the Parliament, because it was willing to make terms with the king without having secured the liberty of religion, which was the thing they most cared about. Therefore, they sent a troop of soldiers to bring the king from Holmby House and keep him under charge of the Army itself. And then, because the Army and the Parliament were in disagreement the king tried privately to treat with each of them, and to make them the more obstinate in their disagreements with each other, hoping he might yet win the day.

But when he tried to escape from the country, and was stopped in the Isle of Wight and held prisoner at Carisbrooke Castle, the Royalists rose in insurrection, and Cromwell saw that the king had been only making pretences. He saw that when the insurrection was put down there could be no peace in the land unless the king's life was ended and the will of the Army was made to prevail.

THE STRANGE SPECTACLE THAT ENGLAND SHOWED THE WORLD

Then England showed the world a strange spectacle. They who had risen in arms against the king in the name of the law, now set up a tribunal to judge the king which was itself without rights from any law. So that now it was the king who stood for the law, and his judges who stood for arbitrary power, or the power that is not restrained by law. And the Army, having this power, cut off the head of the king in the name of the people of England, though all knew that the chief

part of the people of England shrank in horror from the deed.

Thus, in the last days of his life, the false king who had wrought so much ill to the land became a martyr, and throughout those days he acted with a most royal dignity and showed great tenderness and courage. He would make no defence before judges who had no right to try him. In his prison he remained calm and collected, mindful of his friends and his children, but with his thoughts bent on eternity. And when the last hour came, and he stepped through the window of Whitehall on to the scaffold, and looked on the crowds that had gathered to see how a king can die:

> He nothing common did or mean
> Upon that memorable scene,
> But bowed his comely head
> Down as upon a bed.

When the executioner struck off his head and raised it, with the words, "This is the head of a traitor," the crowd answered with groans and tears.

THE MANNER OF MAN THAT OLIVER CROMWELL WAS

Let us turn now to the man who, more than any other, had brought about this just and necessary but terrible deed. Cromwell had striven his hardest to make terms with Charles and to restrain the Army, which would willingly have made away with him long before; but at last he had judged that there was no way left but the way he took. When his mind was made up he never faltered. On the king's death warrant there is no signature written more firmly than Oliver Cromwell's.

For no man could be more utterly merciless than he if it seemed to him that the need arose for firmness, as he showed when he slew and spared not at the pitiless taking of Drogheda and Wexford in Ireland. Yet he had no love for bloodshed; his mercilessness was the more terrible because he loved mercy. He made himself king of England in all but the name, just as he slew King Charles—because he could see no other way of restoring order in the land.

He established order and made the country prosperous. The foreign nations which at first treated England as an outcast State when she had put her king to death, became eager for Cromwell's friendship and feared his hostility. At his bidding the French stopped persecuting Protestants. Since the days of Elizabeth the foreign nations had cared nothing for England's will or wishes, till Cromwell trained his army, and Blake proved himself a match for Van Tromp on the seas. And Cromwell did this when the country had just been rent with a great civil war, and when one-half of it was thirsting to overthrow his government.

OLIVER'S STORMY LIFE ENDS IN A STORM ON HIS GREAT DAY OF TRIUMPH

Perhaps it is not easy to love a man so rugged and ungainly; it was easy to hate him. His enemies hated him so much that during the last years of his life he always wore mail under his dress, lest he should be slain by an assassin.

With all his massive, uncouth force, Oliver was tender of heart. It is pleasant to think how, when the grim soldier had become the greatest man in the land, he brought his old mother up to live in his house; and because the poor old soul lived ever in fear that his foes would kill him, he made a rule to show himself to her every evening, so that she might go to sleep knowing he was safe.

Cromwell had taken up the task of fighting the king, of killing the king, and of ruling the country because he saw things that must be done, and no other was fit or able to do them.

"God knows," he said, speaking sober truth, "I would have been glad to have lived under my woodside, and to have kept a flock of sheep, rather than to have undertaken this government."

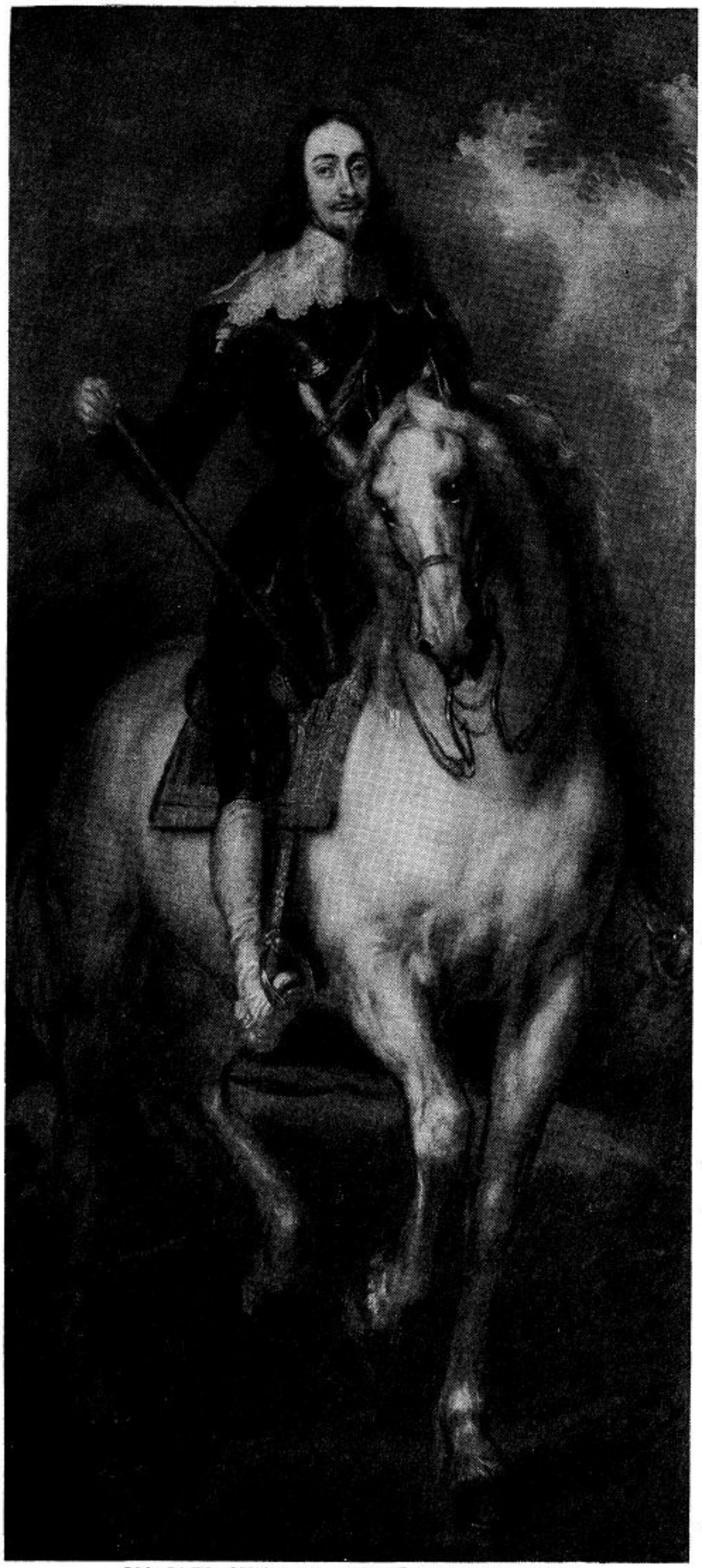
He was willing enough to lay the task down. "My work is done," he said as he lay on his death-bed; "yet God will be with His people."

HOW THEY SNATCHED CROMWELL'S BODY FROM THE ABBEY

He lived a stormy life; it was fitting that a great storm was raging when the hand of Death laid hold upon him. On the anniversary of two of his great victories, Dunbar and Worcester, the spirit of the great Protector passed away.

No Englishman has been more abused than Oliver Cromwell. The Royalist historian of the period, the Earl of Clarendon, summed him up as "a brave, bad man," and that estimate was passed on into several school histories, and warped the judgment of generations.

The bitterness of the supporters of the Stuarts was such that after Charles the Second had succeeded to the throne of his



CHARLES STUART, THE FAITHLESS KING

It is easy, in looking at this picture by Van Dyck, to see why with all his faults men loved King Charles with a passionate devotion. There is a dignity in the delicate face, a charm in the haunting, melancholy eye, a kingly ease in the pose, which makes us feel that this was a man for whose sake men would die. Yet he was a faithless king.

father, Cromwell's body was torn out of its grave in Westminster Abbey, hanged on a gallows at Tyburn, and then beheaded, the head being placed on a pole on the top of Westminster Hall, and the body buried at the gallows. This vengeful course was timed to take place exactly twelve years after the beheading of Charles the First.

But the judgment of later times is shown in the fact that a tablet to his memory has been placed in the Abbey by the authorities of that venerable pile; his statue stands between the Abbey and the Houses of Parliament, one of the finest statues, in one of the finest positions, in London; and the sober mind of history declares him to be not only one of the greatest but one of the most honest of Englishmen. It is remembered in his favour that at the height of his power he remained true to his principles and refused the English crown; that he was tolerant towards all forms of religion in an intolerant age; and that his piety was attested by the purest minds of his generation who knew him best.

It was the life of Cromwell written by Thomas Carlyle, with evidence clear as noonday from Cromwell's own letters, that brought justice to his memory, and almost silenced the voices of hatred and ignorance. Faults he had, of course, but the final verdict of history is that he was a great, good man.

Now let us look at some of the leaders who gathered about Cromwell in those great and stirring days.

At first there were three men who stood up in Parliament against the king—Sir John Eliot, John Pym, and Thomas Wentworth. Of these three the first died, as men say, a martyr to his cause.

The Parliament, headed by these three, made the king sign a declaration, which was called the Petition of Right, that it was not lawful for him to make the people pay taxes without consent of Parliament, or to put people in prison unless they were brought to trial and it was proved that they had broken the law. But he had hardly signed it when he began to demand certain taxes and put people in prison if they refused to pay. But when Parliament came together, Eliot made a great speech which stirred everyone to be more resolute in resisting the king's unlawful demands. This made Charles so angry that he had Eliot thrown into prison and kept in close confinement so that he became very ill ; and, as Charles would not make the imprisonment any the less severe, Sir John died. Men loved his memory, for he had been a very noble gentleman, caring nothing for his own ease, but ready to endure all things if so he might help to keep England a free nation.

Very different was Wentworth, who had been Eliot's friend ; for, just after Charles had signed the declaration, Wentworth went over to the king's side, so that the other side, of which he had been a chief, gave him the name of the Apostate, which means a man who has deserted a great and worthy cause.

From that time there was no man who wrought so shrewdly or so sternly to make the king all-powerful as Thomas Wentworth ; either because, having seen that there was no hope of agreement, he thought the rule of the king would be better than the rule of Parliament ; or because he loved the king and hoped thus to save him.

At any rate, this Wentworth, with the grim face and

OLIVER CROMWELL, THE MAN OF IRON.

This picture by Ford Madox Brown shows Oliver Cromwell on his farm, and we see in his face, calm and hard as if hewn out of granite, the power that is missing from the face of Charles, as we see in Charles's face the grace that is missing from the face of Cromwell. In the whole story of our land there has not been a stronger, braver, truer man than Cromwell.

the fathomless, unsmiling eyes, was sent first to rule the North of England and then Ireland. With an iron hand he ruled, careless of law, but careless, too, whether the foes he crushed were strong or weak; and all had to obey his will while for eleven years he ruled without the help of any Parliament.

But a time came when Charles needed more money than he dared demand without Parliament's consent; and when the Parliament met, seeing how strong and clever a servant Charles had in Wentworth, who was now Lord Strafford, and that if Strafford lived he might make the king too strong for Parliament, they charged him with treason and passed an Act declaring that he was dangerous to the State and must be beheaded. Fearing the wrath of the people, and that if Strafford were not slain they would clamour for the life of the queen whom they hated no less, Charles yielded his consent, even though he had promised Strafford that not a hair of his head should be harmed. Can we wonder at Strafford's bitter exclamation when he heard of the betrayal: "Put not your trust in princes!" This man who had served both parties was now slain, and the king gave up to death his most faithful servant. And now there was none left who could save him from his own doom.

JOHN PYM, WHO ROSE AGAINST THE MAN WHO HAD BEEN HIS FRIEND

The third great opponent of King Charles was John Pym, a country gentleman who was also a lawyer. When the Parliament met again it was John Pym who first ventured to attack the king, and who did everything in his power to bring about the destruction of Wentworth, who had once been his friend. It was Pym who most roused the people in the country, and whose words carried most weight in Parliament. He was the boldest as well as the shrewdest of all the Parliament men. Beside him stood one who was not indeed so skilled an orator, but who was not less honoured for nobility of character, John Hampden, the champion of the people.

These two had some ado both to give heart to those who feared the evils of a civil war more than they hated tyranny, and to restrain those who were too hasty to take thought how best liberty might be secured.

But so great was Pym's influence that he came to be called King Pym, by his opponents in mockery, but in admiration by his friends. And those two, more than any others, the king himself sought to overthrow, so that one day he came suddenly down to the House of Parliament, where the Commons were sitting, having with him a band of soldiers, and willing there to arrest them with three others even in the Parliament itself. But they, having warning, had gone down the Thames by boat into the city of London, where they were too well loved for the king to dare attempt their capture. So Charles retired in wrath, and after that it was but a few months before there was open war between the king and the Parliament.

BRAVE JOHN HAMPDEN IS STRUCK DOWN BY A BULLET IN BATTLE

When the war began John Pym remained in London to direct the counsels of the Parliament, and this he did with great wisdom until he died, about a year and a half after the war began. But John Hampden went at the head of a troop of horse which he had raised at his own cost, to be one of the leaders of the army of the Parliament in battle.

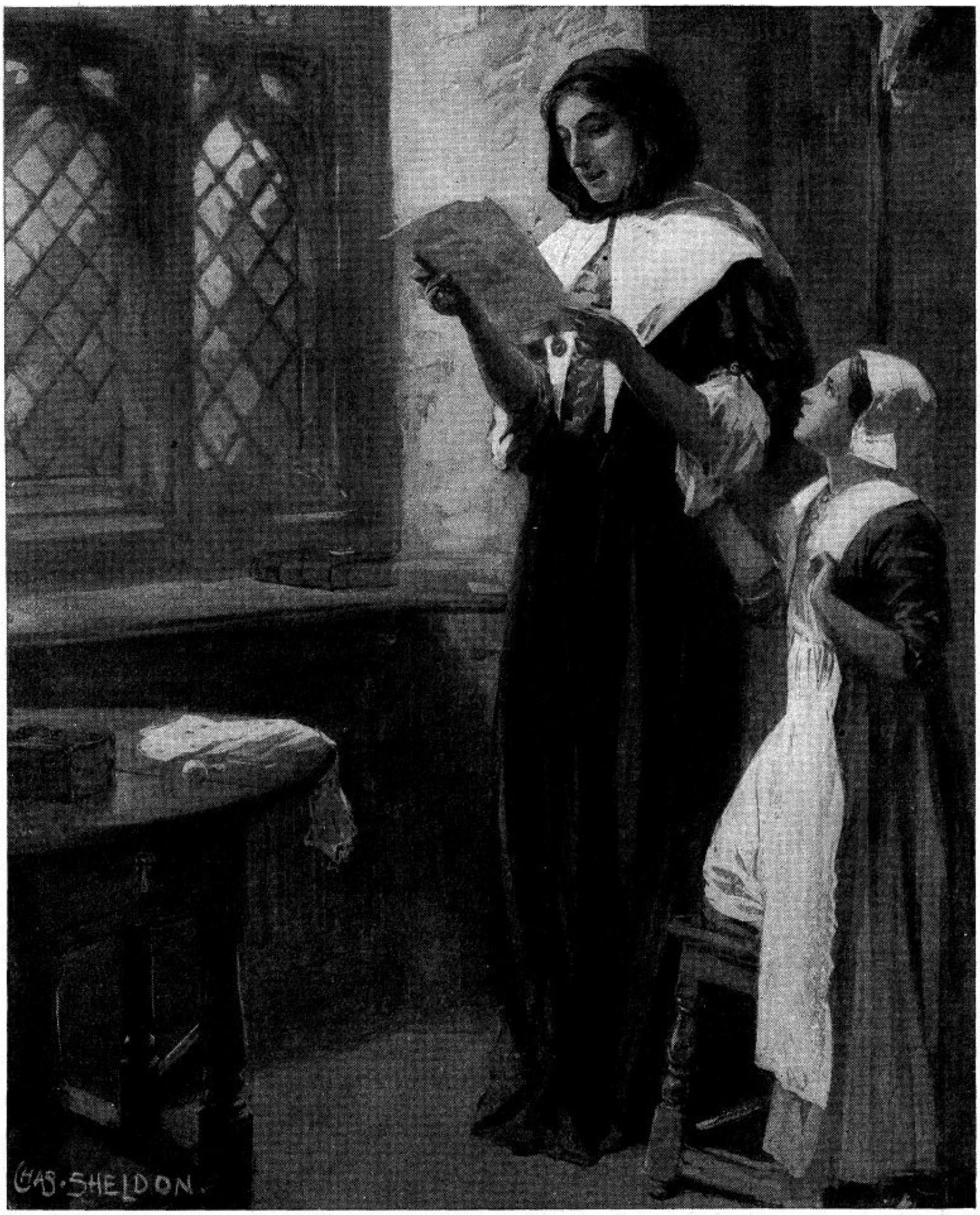
It was Hampden, who when the king ruling without Parliament put an unlawful tax upon the people, refused to pay it, and was punished by the judges who were afraid to give judgment against the king.

He was a man who tried always to do what he counted right, at whatever cost, so that even his foes honoured him; and once it was said that it was only his coolness and wisdom which had restrained the king's party and the Parliament party within the House of Commons from falling upon each other even in the House itself. Therefore all men were grieved, even the king's men, when John Hampden was struck down by a bullet in the fight of Chalgrove Field; for they knew that when he died the chance was less than it had been that the two sides might yet find some way of agreement.

PRINCE RUPERT—CAVALRY LEADER, SEA ROVER, AND MAN OF SCIENCE

The most active leader on the king's side when war broke out was Prince Rupert of the Rhine, a son of Charles's sister. His courage was much greater than his discretion, for his impetuosity lost more than his bravery won.

When the war was lost to the king on land Rupert tried to keep an opening for new attempts by maintaining himself



MRS. CROMWELL WROTE BEAUTIFUL LETTERS TO OLIVER, WHO WROTE FROM DUNBAR TELLING HER OF HIS VICTORY, AND ADDING, "THOU ART DEARER TO ME THAN ANY OTHER CREATURE."

at sea as the leader of a royalist fleet. The Scilly Isles and the Channel Islands were his bases for a time, but he was finally driven out of the seas around England by the bravery and skill of Admiral Blake, who left him no rallying place, but declared that any country that gave Rupert's ships a place of refuge was forthwith by that act an enemy of England.

But Rupert was more than a dashing cavalry leader on land and a daring rover on the seas; he was a keen student of science, and the discovery of the process of printing pictures known as mezzotint stands to his lasting credit.

Also on the king's side was that fine character Lucius Carey, Lord Falkland. When the Parliament met which was called the Long Parliament, he stood on the same side as Pym and Hampden,

hoping the king and the Parliament might both learn wisdom and come to agreement; but when he saw them growing more bitterly at enmity, till the Parliament seemed to be grasping at the whole power, he went over to the king's side, fearing the tyranny of Parliament more than the tyranny of the king. For this reason in sadness of soul, Falkland chose loyalty before liberty; and when he was slain in battle men said that he had died willingly.

CROMWELL'S CLOSEST FRIEND IN THE ARMY THAT WON THE WAR

Henry Ireton was Cromwell's most intimate friend in the army that won the war. He was a Nottinghamshire gentleman, who had been educated at Oxford and trained for the Bar, and quite early he saw that Cromwell was a military genius. Cromwell, on his part, knew the value of Ireton's superior education, knowledge of the law, and force of character, so he made him his cavalry leader and took him as his intimate adviser, and presently Ireton married Bridget Cromwell and was his leader's son-in-law.

At first Ireton's views of the king were quite moderate. He believed in giving Charles every chance of winning back the people's favour. When, however, he found that Charles could not be trusted, he became sternly bent on punishing him for what he thought was treason to the nation, and he signed the warrant for his execution. When the war passed over to Ireland, Ireton acted there as Cromwell's second in command, and there he died on active service. His body was brought to England and buried with honour in Westminster Abbey, but after the Restoration of the revengeful Stuart family to the throne the grave was opened and the body of Ireton was hanged aloft at Tyburn, near the place where the Marble Arch now stands, and then buried at the foot of the gallows.

THE BLIND PEOPLE WHO TOOK THEIR REVENGE ON THE DEAD

John Bradshaw, a Cheshire lawyer who had removed to London, was chosen to preside over the Council that tried the king in Westminster Hall. Bradshaw was not present at the meeting that elected him President of the Council, and at first he wished to be excused from taking the office, but as he was urged to consent, he gave way, and he conducted the trial with great sternness. As a convinced Republican Bradshaw was an outspoken opponent of Cromwell when he feared the Protector might allow himself to accept the kingship. He died before the Restoration, and was buried in the great Abbey, but his body also was brutally dug up, carted away to Tyburn, and exposed there.

An indignity only a little less abominable was practised on the body of the heroic Admiral Robert Blake, General of the Sea in the Commonwealth period. It was disinterred from the Abbey by order of Charles the Second and, along with the bodies of Cromwell's mother and daughter, was buried in St. Margaret's churchyard.

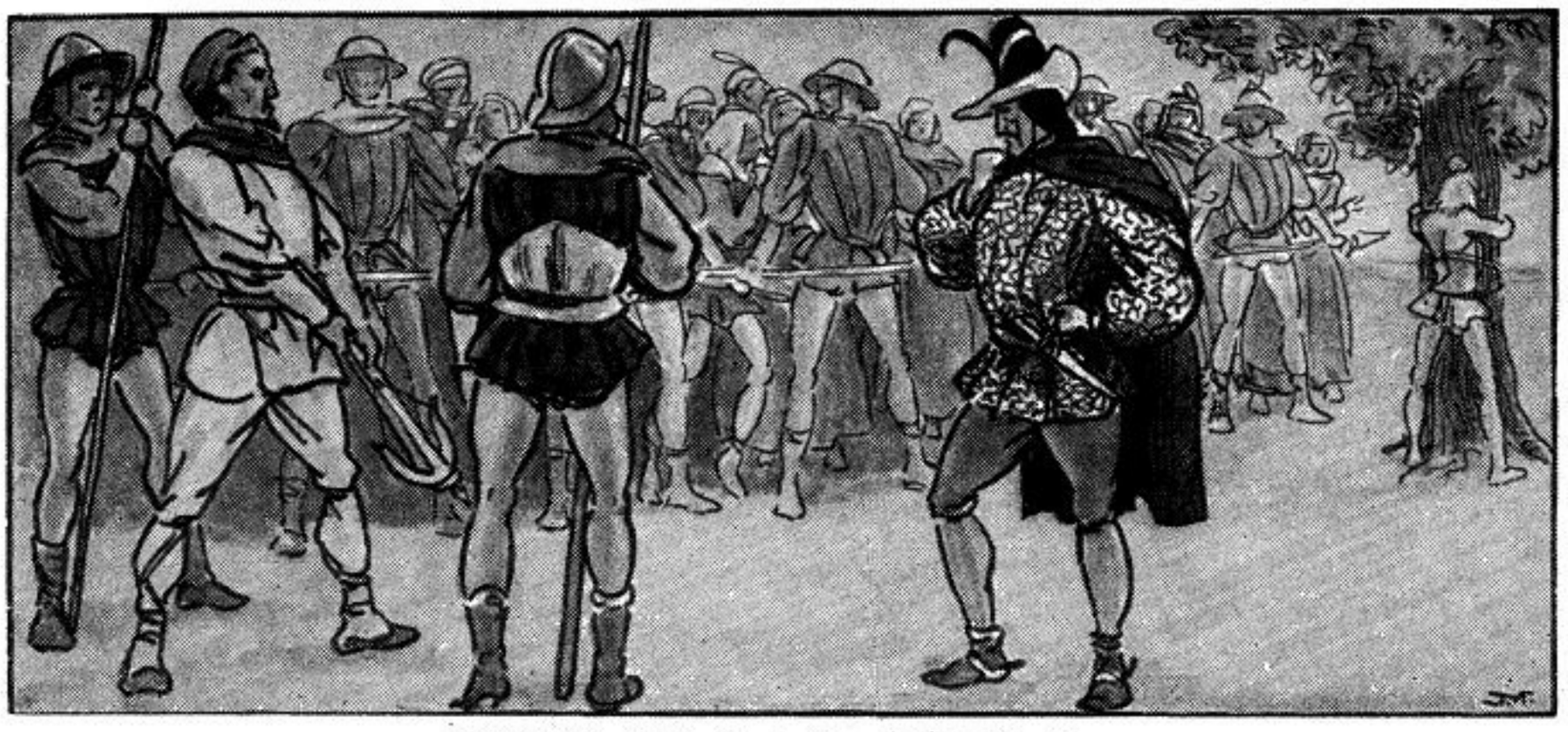
Yet Blake had not taken any part in the trial and execution of the king. His offence, in the eyes of the people who were wreaking their revenge on the dead, was that he had been the man who chased Prince Rupert off the seas when the prince tried to continue the Civil War there. That Blake had defended England against attacks from abroad, and had gained the command of the seas, was not counted as patriotism, though again and again the country had offered him enthusiastic thanks for gallant exploits.

THE MOST FAMOUS SEAMAN OF HIS TIME IN THE WORLD

Blake was a Somersetshire man who, after an education at Oxford, became a sea-trading merchant, and then a member of Parliament. When the war began, he helped to defend Bristol for the Parliament and was the last to surrender. Later he made successful defences of Lyme and Taunton, and then was transferred to a command at sea. Against the Dutch, in many desperate battles, the Spaniards, the Portuguese, and against Algerian and Tunisian pirates, he won great victories that made the open sea a safe highway for British ships. Worn out by incessant toil, he died outside Plymouth Sound as he came homeward, the most famous seaman in the world.

Any fair review of Cromwell and the men who gathered about him must admit that, after great patience, they took up arms reluctantly though the cause they defended was just, for it was resistance to forms of oppression which the laws and traditions of the nation did not allow to kings. They developed in England a sturdy public spirit, and individually they were men of a rare strength of character, who in a time of turmoil and chaos raised the nation to a high level in the opinion of all mankind.

The Great Stories of the World That Will Be Told For Ever



WILLIAM TELL

We do not know whether he lived or not; but he lives in the story books of all the world.

ONE fair day there walked across the market square of Altdorf in Switzerland as fine a looking man as one could wish to see. Tall and straight, broad and shapely, with ruddy, bearded face and proudly-held head, this man of the mountains strode with clean, swinging stride across the square, a look of bright happiness in his eyes, and a cheerful word of greeting for his friends.

Many turned to say, "There goes William Tell, the crossbowman of Bürglen."

This man, who was said to be the finest crossbowman in Switzerland and the best handler of a boat on the storm-swept lake of Uri, lived quietly in a mountain cottage with a wife who shared his every thought, and children for whom it was his pleasure and delight to work.

He hunted deer in the mountains, and went a-fishing on the lake. His children never lacked good food and decent clothing. His home was trim and neat. There was no family in that district more firmly established in peace and content.

Tell had sold the pack of deerskins which he had brought with him to Altdorf. He was on his way now to buy winter clothing of warm wool for his children. He had money enough and to spare, and he was in a mood of great happiness. In an hour or more he would be singing a song on the road to his mountain home.

Suddenly he felt his arm seized, and found himself in the grip of an Austrian soldier. In another instant he was surrounded. The soldier who had seized his arm pointed to a pole with the ducal cap on the top of it.

"It is death not to bow to that cap, and you know it!" said the soldier.

A silence fell upon the whole square. People left their trading and crowded round the group. A thing greater than trade was at stake now—a man's freedom, a nation's liberty.

William Tell had flushed a deeper red. He brought his eyes from the cap on the pole to the soldier's face.

"I have done nothing unlawful," he said slowly.

"You have insulted the majesty of the Duke!" said the soldier.

William Tell kept a steady eye.

"Why," said he, "should a man show more reverence to an empty cap than to any empty cloak or a pair of hose?"

At this there came from behind the soldiers the figure of the governor of the district, the tyrant Gessler.

It was this Gessler who, set over the once free Swiss by their conqueror and oppressor, the Duke of Austria, had trodden liberty under foot, had murdered

and imprisoned all who stood against him, and, as a last barbarity, had declared that everyone who did not do homage to the badge of Austrian rule set up on the pole in their market-place should die.

William Tell faced the governor. He feared no man. No one could break his proud spirit. On his mountain he had brooded upon the shame of the slavery which enchained his country, and had already spoken with his friends of resistance. Never, never, would he do homage to the hated badge of the tyrant's mastery.

"So you would make a jest of the sign of majesty?" asked the governor, approaching him, while the soldiers saluted. At that moment there came from the crowd a child's cry of "Father! Father!"

The crowd turned about, opened out, and presently William Tell's little son, who had come without leave to the fair, was rushing to his father.

The governor caught the boy's arm.

"Is this the brave traitor's son?" he asked scornfully.

"Hurt him not," said Tell. "He is my first-born."

"Oh, I won't hurt him!" answered the terrible Gessler. "If any harm should come to him it will not be by me, but by you." A horrible smile lighted his eyes. "Here," said he to a soldier, "take the boy and tie him to the trunk of that linden tree over there, and place an apple on his head."

"What is this for?" demanded Tell.

"I am told that you are called the crossbowman of Bürglen," replied the governor, "and I should like you to give me an exhibition of your skill. Your life is forfeit. But I am in a merciful mood; I will give you a chance of redeeming it. Come, listen to me. If at this distance you can shoot an arrow so as to split the apple on the head of your first-born I will let you go free. If not—if you miss the apple or kill your child—I will execute you, here and now."

"Have you no mercy?" cried Tell, trembling with indignation. "And do you think I will attempt to save my own life at the risk of my son's?"

"I am doing you a favour," replied Gessler. "Think. By a lucky shot you may save your life and go home!"

Tell held out a hand which trembled.

"How can a man who loves his son aim with a steady hand an inch above his temples? Ah, look at the child! My lord, look at him! He is no kin of yours; you know nothing of the pretty ways by which he has climbed into a father's heart, the innocence of his eyes, the beauty of his face! Am I to risk that life?"

Gessler laughed brutally.

"Well, you either shoot or die."

"Then I will die."

"And first your child shall have his neck wrung before your eyes."

A blinding passion of indignation overswept the noble soul of the mountaineer.

"Give me the bow!" he said. "One thing in mercy I ask. Let the child's face be turned away from me. Let me not see his eyes fixed upon me."

A way was cleared between father and son. A dense multitude stood on each side. The boy, with his face to the tree, bound by ropes to its trunk, felt the apple weigh like lead upon his head.

A dreadful silence fell upon the market square. William Tell chose two arrows. One he thrust in his girdle; one he fitted to his bow-string. Then for a moment he stood, a little bowed of shoulder, with his eyes downcast; he was praying. You might have heard a leaf fall, so still were the people gathered round.

Then Tell raised his head; his eyes were steady, his hands had become still, his face was like iron. He brought the cross-bow to his shoulder and laid his eye to the feather of the shaft. *Twang!*

The arrow shot forward, and, as it were at the same moment, buried itself deep in the tree. The apple fell in equal parts on either side of the boy's head.

A roar of cheering went up to heaven, and Gessler turned to Tell.

"A good shot, traitor!" he said cruelly. "But tell me, for what reason did you take two arrows?"

Tell laid his hand upon the arrow in his girdle.

"If the first arrow had hurt my child," he said, "this one by now would be through your heart!"

"Oh! So I run in danger of my life?" said the governor. "But I will keep the pledge I gave you. You shall not die. I will give you your life. But the rest of that life you will spend in the dungeons of my castle, and your bowstring will not then be a danger to me."

At this Tell was seized again, and rushed by the soldiers through the scowling mob to the quay, where the Governor's ship was moored.

"HURT HIM NOT," SAID WILLIAM TELL; "HE IS MY FIRST-BORN"

But as the ship crossed the lake of Uri a storm arose, and it seemed as if everyone would be drowned. The Austrians could not manage the vessel, and began to abandon all hope of saving her.

In their panic they remembered that Tell was reputed to be the best handler of ships in that part of the world, and they spoke to the governor.

"Loose him, and let him take the helm," said Gessler.

Tell got the vessel to right herself, and set her head for the opposite coast. But he was now thinking, not of Gessler and the

Austrian soldiers, but of freedom—his own freedom, and the freedom of Switzerland.

He brought the ship close to a rock that jutted out from the coast, and then sprang suddenly upon the rock, and left the Austrians to save themselves.

Swift of foot, he scaled the rocks, climbed the cliff, and made his way across the mountains to a place on the road which Gessler, if he saved himself, would have to pass. Here he lay concealed among the bushes with an arrow fitted to his bow-string, his heart set on delivering Switzerland from the tyrant.

Presently as he waited there came to him the sound of the tramping of feet.

"And if I live to return to Altdorf," Gessler was saying, "I swear I will destroy the whole brood of this traitor Tell, mother and children, all in the same hour."

"You shall never return!" said Tell to himself. And, as the soldiers went marching on, he let fly the arrow, and Gessler dropped dead in the dust.

William Tell inspired the rising of the Swiss people which led to the overthrow of the Austrians and made Switzerland a free country.

They would have made him king, but he shook his head, and went back to his home among the mountains, which was more to him than many palaces.

THE FRIEND OF THE WITHERED TREE

NEAR the city of Benares there was once a great forest which trembled one noon to the steps of a god. Indra of the Thousand Eyes came walking through the earthly groves. Even in Heaven he had hardly seen fresher leaves or more beautiful cascades of blossom.

Then, in the midst of this luxuriant life, he came on a great tree which was withered and blotched and rotten.

Indra approached the dying tree, and was amazed to see a parrot sitting on its boughs looking lean and sickly.

"What are you doing there, foolish bird?" he cried. "Are there not fair and fruitful trees enough? Why do you sit in the shadows of decay?"

The parrot bowed till its beak touched its claws, and replied:

"Glorious king! Once this tree was peerless in its beauty and strength. I was born under its leaves; I learned to fly from one of its branches; here, since my earliest days, I have found shelter and friendship. But the other day a hunter's poisoned arrow glanced aside into its bark, and its sap has turned to fire, and it is dying. O king, how could I leave the tree in its misfortunes?"

Indra was moved.

"Lowly bird!" he cried, "I would that men also were as true and compassionate to their friends! I will reward your devotion by granting you any boon you may ask."

The parrot did not hesitate.

"Restore the tree, great king," it said, "and I will sing your praises for ever."

Indra laid his hand on the bark. Instantly the fungus and mildew dropped away: the rotten leaves fell to the ground; fresh sap darted through its boughs, impetuous as a spring river, and buds of green and crimson burst out on every twig.

Wise is he who chooses a friend like the tree's; blessed is he who has a heart, compassionate and grateful, like the parrot's.

THE ANGEL OF THE DIMPLES

AN angel, about to leave the world, saw a child sleeping in some long grass.

"What a lovely child!" exclaimed the angel. "Surely it must have been stolen from heaven."

And to make quite sure that the little one really belonged to the earth, and that its body was made of perishable stuff, the angel, with two fingers of its divine hand, fingers rosy with the beauty and tint of heaven, touched the baby cheeks.

He touched them quite close to the mouth on each side of the lips, at the place where ends the circle of the smiles. Then, reassured, the angel said: "The child is really human after all," and, leaving the child alone, the angel flew away.

But where they had rested his fingers had left their prints.

That is why, my daughter, on each of your cheeks, when you begin to smile, two little dimples appear—two pretty little dimples of the angels!

That is why I so often amuse myself by making you laugh, just to see the dimples from the angels of heaven.

IN THE STRANGE HOUSE

ONE day a scholar fell into talk with an Irish peasant who was resting for a while from his work.

They spoke of what they both loved, the old stories of their country, and although the scholar thought he knew all that books could tell him on the subject, he soon found that the peasant knew more. Songs and stories that can live for hundreds of years without the help of being written down must be good ones indeed; here is the pretty tale of Dermot that the professor heard for the first time from the peasant.

First let it be told that Dermot was a famous character in Irish legend, something like our Lancelot, belonging to an order of Chivalry that corresponds to our Round Table. He was as remarkable for his comeliness as his valour. It is recorded that he had sword-blue eyes, ruddy-brown cheeks, and hair that shone under his helmet. On his forehead was a little mark, and the peasant's story relates how Dermot came by it.

SHE PUT HER FINGER ON HIS FOREHEAD

Once when Dermot and three other knights were hunting they went astray into a dark and desolate country. They wandered there for some time, until at nightfall they came to a hut. They knocked on the door. A voice bade them enter. Dermot lifted the latch, and they saw an old man, a lovely maiden, a ram, and a cat, all assembled together before a blazing hearth.

When Dermot asked for shelter the old man bade the strangers welcome, but there was an air of something strange about him and about everything in the hut.

A meal was prepared for the guests in silence. As they were about to partake of it the ram leapt up on to the table. One of the knights seized him by the fleece to fling him down, yet, though he wrestled with all his force, he could not move the creature. One after another his companions struggled with the ram, and one after another these mighty champions were discomfited.

Then the old man told the cat to fetch it down. She overcame the ram in a moment, threw it to the ground, and drove it to a corner, where it lay down meekly to be tethered.

The old man said to the mortified knights: "You need not hang your heads, spear-men. The ram is the World, and the cat is Death, who overcomes all things."

At these words the knights were more amazed than ever, and they slept little, partly for the wonder of what they had heard, and partly for love of the maiden, whose beauty made a soft light about her in the darkness.

In the morning when they made ready to go one of the knights took courage and asked her to be his wife.

"No," she said, "I belonged to you once, and I never can again."

He stood astonished, for he was certain that he had never seen her before. The same reply she made to all, but to Dermot she said: "Ah, Dermot! I belonged to you once, and I never can again, for I am Youth who never returns. But I will make you a gift so that all others shall love you in my stead."

She put her finger tip on his forehead, and it left a little shining mark. From that hour everyone who saw Dermot loved him.

Then the knights rode away very pensive; and never again could they discover the desolate place, or the maiden called Youth.

THE THIRTEENTH MAN

THE story of Heligoland is going to surprise you very much.

For us this word means a naval base: it means ruthless war; it will always bring to the minds of this generation a dozen dreadful stories of submarines appearing suddenly at a ship's side, like a revolver whipped out of a man's pocket; of people struggling in the water; of hot hatred, and a thirst for vengeance.

Yet this sinister place is called Holyland, and its legend is a tale of peace.

Tradition says that a long time ago the Frisians determined to draw up a code of laws. They entrusted this solemn task to their twelve noblest men. First the elders collected the rules that various tribes and powerful families had made for themselves; from these they meant to frame one code which should serve for all the Frisian people. A quiet place was necessary for their discussions, so the twelve set sail for a certain isolated spot.

But Aegir, the savage sea-god, seems to have had no kindness for law-makers. He sent a storm which blew them far out of their course. The boat was tossed helplessly about, and it seemed as if the twelve men would perish, and with them half the wisdom of the Frisians.

Then they thought of the gentle god Forseti. In Asgard, that home of the violent and battle-loving Northern deities, he was the law-giver and peace-maker. As the patron of justice and reason the elders called upon him in their peril.

All at once they became aware of a thirteenth man on board. Silently he took the rudder, and steered the boat into the teeth of the storm. The twelve men felt as if their lips were sealed and their limbs enchanted.

Presently land appeared. The boat ran aground. The new-comer stepped out, and flung his axe; where it struck the ground there gushed up a stream of water. He drank of it, and sat down. The twelve men followed his example in awed silence.

Then, in a low, ringing voice he began to expound a code of laws. It was so clear that a child could understand it, so just that the most subtle mind could not find fault with it. As the twelve listened entranced they felt that divine justice itself was speaking.

Suddenly the voice ceased, and there were only twelve men sitting together on the shore.

"Forseti has been here!" they cried.

The code which was so miraculously dictated to them became the law of the Frisian people. The place where it happened was called Holyland in honour of Forseti's visit. All the great councils of justice were held here, and each man who took part in them first drank silently of the cold spring in token of allegiance to pure justice. If any quarrelled or shed blood on the island he was held accursed.

Such was the tradition of the place. Even the most avaricious Viking did not dare to raid its sacred shores; all the Northern nations looked upon it as the place of peace; none dreamed that it could ever belong to Tyr, the sword-god!

THE PROUD KING OF KAMERA

THE Negro king of Kamera, in Africa, was a proud, stern man, and his men feared him, and instantly carried out his slightest wishes. But one day, when he was boasting that all men were his servants, a wise old Negro called Boukabar reproached him, saying: "All men are servants of one another."

"So I am your servant, am I?" said the king in great anger. "Then prove it. Force me to work for you before sunset, and I will give you a hundred cows. Fail, and I will kill you, and so show you that I am your master."

"Very well," said Boukabar.

Being a very old man he had to use a stick in walking, and just as he took it up to go out a beggar came to the door.

"Permit me," said Boukabar, "to give this poor man something to eat."

Taking some food in both hands, he tottered past the king, and his stick slipped from under his arm and got entangled in his dress, and nearly tripped him up. And he cried to the king: "Please pick up the stick, or I shall fall."

The king picked it up without thinking, and Boukabar then laughed merrily and exclaimed: "You see, all good men are servants of one another. I am waiting on the beggar, and you are waiting on me. But I do not want the cows. Give them to this poor man."

The king did so, and took Boukabar as his chief counsellor, and Boukabar showed him how to rule his people well.

THE STORY THAT HAD NO END

THERE was a certain king who was very fond of hearing stories told.

To this amusement he gave up all his time; for ever he listened to tales, yet he was never satisfied. All the exertions of his courtiers were in vain. The more he heard, the more he wanted to hear. At last he made a proclamation that if any man would tell him a story that lasted for ever he would make him his heir, and give him the princess, his daughter, in marriage; but if anyone should pretend that he could tell such a story, and should fail—that is, if the story did come to an end—he was to have his head chopped off.

For such a rich prize as a beautiful princess and a kingdom many candidates appeared; and dreadfully long were the stories that some of them told. Some lasted a week, some a month, some six months: poor fellows, they all spun them out as long as they possibly could, we may be sure; but all in vain; sooner or later they all came to an end; and, one after another, the unlucky storytellers had their heads chopped off.

At last a man came who said that he had a story which would last for ever, if his Majesty would be pleased to give him a trial and listen.

He was warned of his danger; they told him how many others had tried and lost their heads; but he said he was not afraid, and so he was brought before the king. He was a man of a very composed and deliberate manner of speaking; and, after making all requisite stipulations for time for his eating, drinking, and sleeping, he thus began his story:

"O King, there was once a king who was a great tyrant; and, desiring to increase his riches, he seized upon all the corn and grain in his kingdom, and put it into an immense granary, which he built on purpose, as high as a mountain.

"This he did for several years, till the granary was quite full up to the top. He then stopped up doors and windows, and closed it up fast on all sides.

"But the bricklayers had, by accident, left a very small hole near the top of the granary. And there came a flight of locusts and tried to get at the corn; but the hole was so small that only one locust could pass through it at a time.

"So one locust went in and carried off one grain of corn; and then another locust went in and carried off another grain of corn; and then another locust went in and carried off another grain of corn; and then another locust went in and carried off another grain of corn; and then another locust went in and carried off another grain of corn——"

He had gone on thus from morning to night, except while he was engaged at his meals, for about a month. Then the king, though a very patient king, began to be rather tired of the locusts, and interrupted his story with:

"Well, well, we have had enough of the locusts; we will suppose that they have all the corn they wanted; tell us what happened afterwards."

The storyteller answered, very deliberately: "If it please your Majesty, it is impossible to tell you what happened afterwards before I have told you what happened first."

The king listened with admirable patience six months more, when he again interrupted him with: "O Friend, I am weary of your locusts! How soon do you think they will have done?"

To which the storyteller made answer: "O King, who can tell? At the time to which my story has come the locusts have cleared away a small space, it may be a cubit each way, round the inside of the hole, and the air is still dark with locusts on all sides; but let the king have patience, and no doubt we shall come to the end of them in time."

Thus encouraged, the king listened on for another full year, the storyteller still going on as before.

At last the poor king could bear it no longer, and cried out:

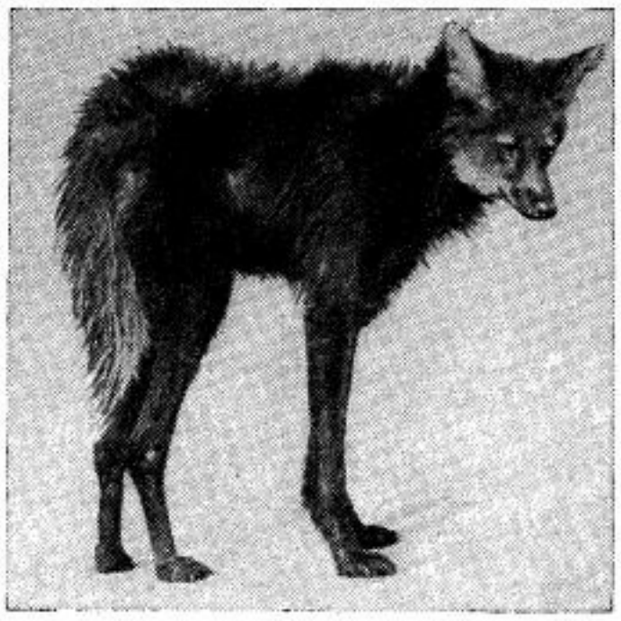
"O man, that is enough! Take my daughter, take my kingdom, take anything, take everything, only let us hear no more of those abominable locusts."

And so the storyteller was married to the king's daughter, and was declared heir to the throne; and nobody ever expressed a wish to hear the rest of his story, for he said it was impossible to come to the other part of it till he had done with the locusts.

The folly of the foolish king was thus at last stopped by the ingenious device of a very wise man.

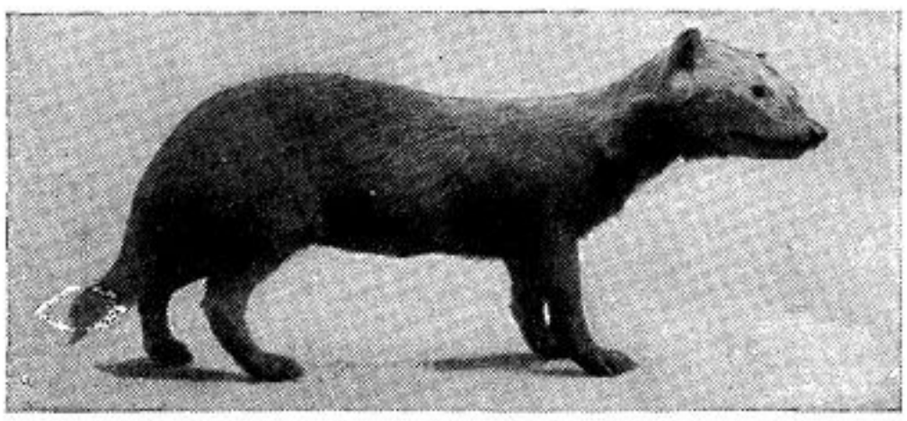
THE WILD WORLD COUSINS OF THE DOG

LONG-EARED FOX

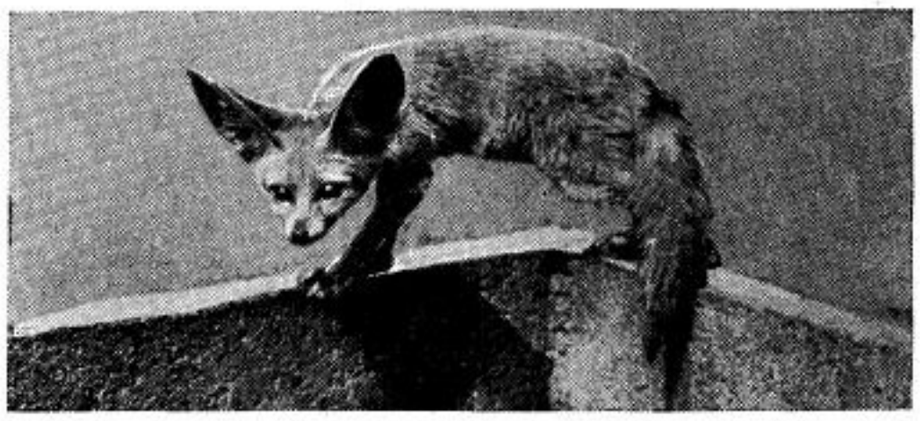


MANED WOLF

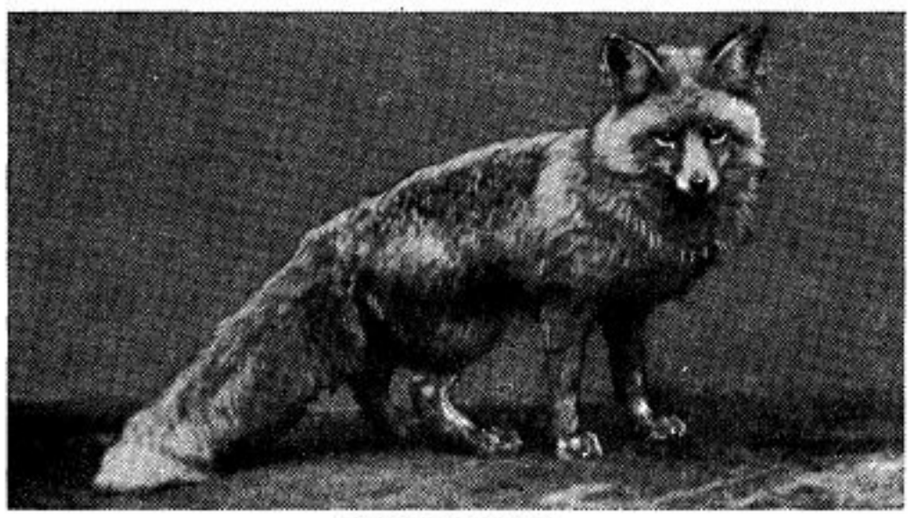
CAPE HUNTING DOG



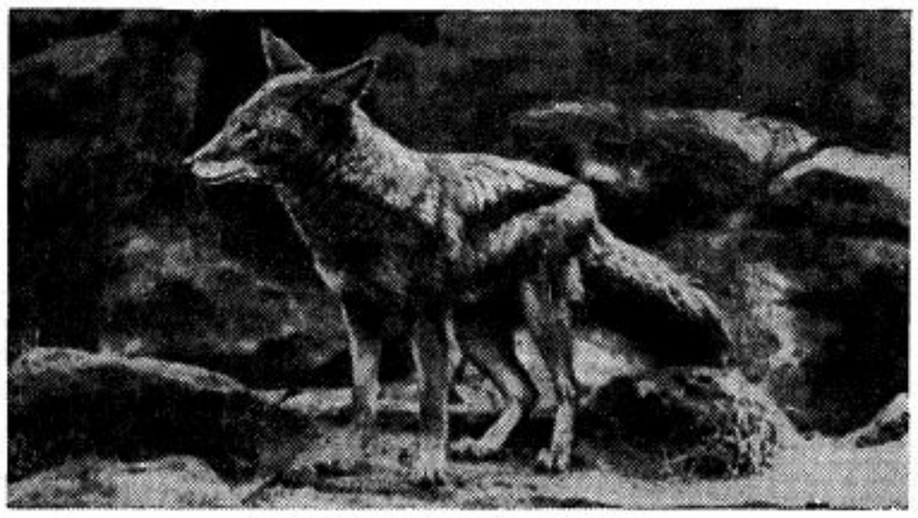
THE BUSH DOG OF GUIANA



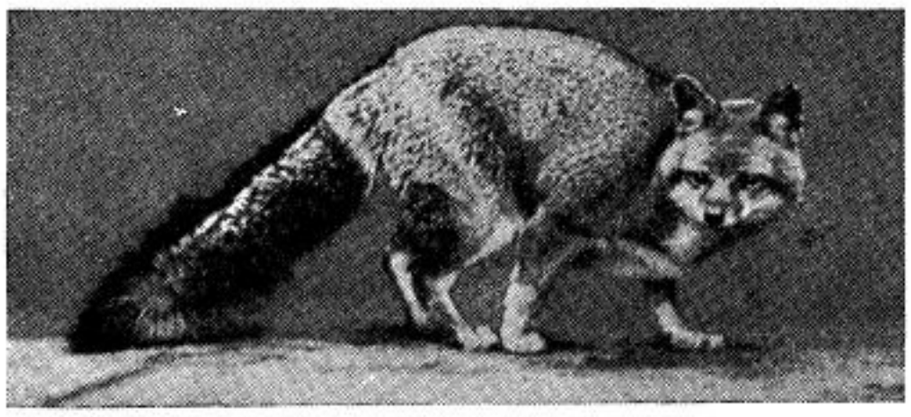
FENNEC FOX



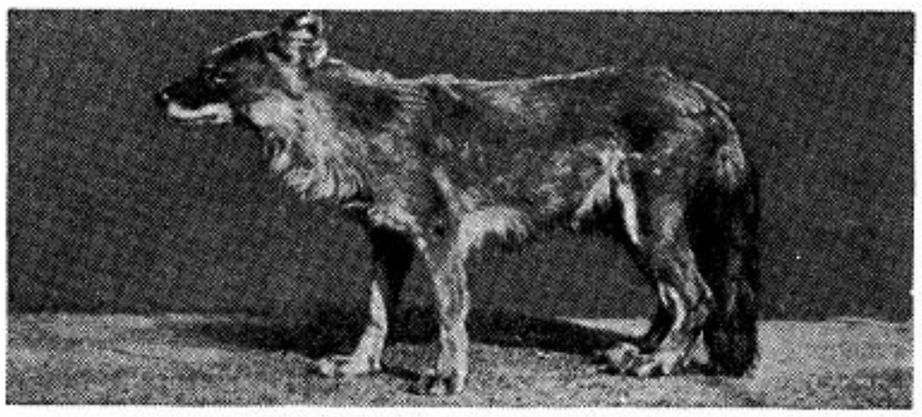
DESERT FOX



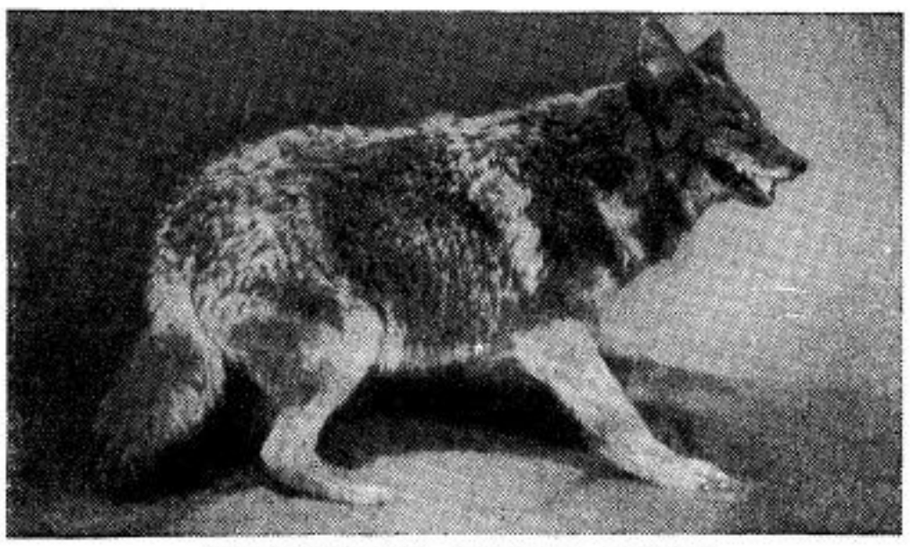
BLACK-BACKED JACKAL



SILVER GREY FOX



SIBERIAN WILD DOG



COYOTE OR PRAIRIE WOLF

SIBERIAN WOLF

An Arctic fox out in a blizzard

THE WILD DOGS

WHEREVER men venture into the wilds, a creeping murmur is heard. It is the voice of the dog tribe, stirring in the night-time.

Wolf, jackal, fox, and wild dog, they are spread like a living coverlet over the greater part of the Earth. Where we go, there they are, before us or in pursuit. Where we can barely maintain life, they find food; where we starve and die, they can flourish. Let us look at their haunts.

Sledging through the Russian night, Miss Marsden, an English missionary, says to her driver: "The cold and darkness make me afraid. Let us shelter in one of those cottages whose lights I see."

"Madame," answers the Russian, "they are not cottage windows that you see; *they are the eyes of wolves.*"

When 25 men lay dead in that expedition which enabled Bering to discover the strait which bears his name, it took a dozen men hours to bury a comrade; not because of snow and icy sand, but because hundreds of little white and blue foxes fought wildly for the body.

The man who takes his life in his hand to seek for hidden gold in Alaska finds there a grim, grey giant stalking him from afar.

"Who goes there?" he cries.

"Wolf!" is the answer which does not come to his question.

A sound disturbs the quiet of the prairie darkness, and the Red Indian, with his ear to the ground, explains its meaning in a word, "Coyotes."

In the raging heat of India a tiger, lord of so much and so many, is seen fighting a running retreat with a changing cloud of animals worrying at his flanks. In the morning, where the fight has ended, a strip or two of striped hide and a dismal wreck of carcase are found, and hunters know that the wild dogs were the victors.

From a noble tomb in a silent city of India, where splendour and magnificence once proclaimed the power and majesty of the rajah now within the tomb, steals a lurking figure to cry to the rising moon. It is a jackal, reigning where mysterious tragedy has vanquished human grandeur. The jungle has come back to the city, and the jackal, whose kind were there before the city, has ventured in and made his home in the abode of death.

So, wherever the eye may turn, this great tribe is either in possession as original owners, or surging back where civilisation has failed, or disputing right of way with us as we breast the current of wild life which is their home.

Brains and courage have made this widespread tribe what it is. The dogs have not a pawful of talons between them.

They are blunt-nailed, so they cannot climb trees after the fashion of leopard and jaguar, nor pull prey down with their claws like a lion. But they have grand teeth, they have sturdy limbs, they have speed and endurance, which carry them fast and far from the setting of the sun until the dawn. They have the wit to combine, to hunt in concert, and they are in intelligence far above the cats, their natural enemies.

THE UNCONQUERABLE WOLF, KING OF ALL THE GALLOPING TRIBES

They are one of the most courageous, fierce, and venturesome of all the animal groups, and it is thrilling to remember that from this assembly our rude forefathers took our first partner in life—the first of man's aids to hunting, his first guide in the dismal wilds, the first sentinel to guard the little cave he called his home.

King of all the galloping host is the unconquerable wolf, an animal whose history in relation to the human family is the most impressive in all life's annals. It is nothing to him that he has given hostages to man. It is nothing to him that some of his line have been wooed to service with human beings.

He remains a splendid and terrible savage, worth his place assured in the scheme of nature by reason of his audacity, his cunning, his ability to front adversity and counter changing conditions with modified tactics. Civilisation has advanced with all its armament against him. He has given ground on a broad front, but he has doubled back, broken through on our flanks, and is still a terror to us in lands where the arts of peace have reigned for two thousand years.

THE TERRIBLE ANIMAL PERSISTING THROUGH AGES OF PERSECUTION

In spite of the organised measures of a population numbering scores of millions, the wolf is still with us, and remains the most formidable and deadly animal in Europe after thousands of years of persecution. His hold on life is marvellous. He no longer shares Great Britain with us, but he was here two centuries ago. The enclosure of land made it possible to slay all the wolves in our little islands, but Europe is big, and the wolf is there.

Don Quixote travelled to glorious and comic adventures in Spain, and made rare havoc with his tilting at windmills, but he might have had really good hunting had he set his lance against wolves. For the land of that delightful hero still has wolves, and two varieties of them.

Smiling France still has these terrors, too, lurking in her dim, mysterious woods. Italy, with oranges and lemons ripening in her golden valleys, looks with foreboding to the innocent-looking Apennines, for wolves hide there in summer. But when snow and famine touch the hills, they launch themselves on the plains to devour sheep and cattle, and in their raging hunger they assail human beings.

In any year when conditions menace wild life, the same story may be traced. Take the winter of 1921-1922, for example. At a time when French wolves were spreading terror in the department of Meurthe-et-Moselle, wolves tracing back to wolves that Caesar hunted swarmed down into the plains of Northern Italy and attacked human beings as their ancestors attacked before Italy was a civilised land. At the same time the Rumanian wolves were out in the Ploesti district, killing in one night five peasants and injuring 30 more. As for Russia and Asia generally, a whole literature of tragedy might be written on the sad tale of life sacrificed to make wolf feasts.

GIANT WOLVES AND PYGMIES, COYOTES AND JACKALS

Our European wolves are small compared with the great timber wolf of America, and puny compared with the giant wolf of Alaska. This Alaska wolf is a superb animal, nearly six feet from the muzzle to the tip of the tail, and almost 32 inches high, and with a head which suggests a great bear.

Dimensions such as those enable us to imagine the outline of some of the terrific beasts which once flourished in the dog family, and attained the size of polar bears! They are gone to the kingdom of fossils, and today it is not the largest wolf that is most feared. It is the European species which carries off the palm for ferocity. Men who have met both would rather grapple the giant of Alaska than the smaller animal in Spain or Scandinavia.

Probably the reason is simple—that European wolves have been so long in contact with massed humanity that the necessity of living under fiercely competitive conditions has permitted only the most savage and audacious to survive. The fight between man and wolf in Alaska, and in the wide ranges of the timber wolf, has yet to grow intense.

All over Europe, except in Britain and north and central Germany; over wide spaces of Russia; throughout the greater part of Asia as far east as Japan and ranging throughout North America, the wolf still clings with fierce teeth to life.

Yet, wide as is the distribution of the group, it has its curious gaps. Wolves are not found in Africa—though dogs are there. They are not found in South America proper. Yet down in the Falkland Islands, in conditions so inclement that the wind blows the grain out of the growing ears of corn—there we have wolves, an amazing

A PACK OF SNARLING WOLVES ON THE HUNT FOR FOOD

fact. Ordinary wolves move in packs, and that mainly at night. The so-called Antarctic wolves of the Falklands stalk about by daylight, singly, or at most in family groups. They do not, like the majority of the dog tribes, hide in rocks or indeed anywhere above ground, but burrow like foxes.

They have distinctive features, unique fur and peculiar size, neither that of wolf nor coyote, though apparently they sprang from coyote strain. But how came they in the Falklands? These British islands are separated by 250 miles of deep sea from Patagonia, the nearest land, there are no other wolves south of Mexico, yet here these make their home. The man who solves this mystery will add a first-class romance to the wonders of animal distribution. There is no other case in the world where so small and broken a land-mass, far from a mainland, has ever supported so large a native animal. It is to be feared that the Antarctic wolf will not long enjoy his supremacy, for his tribe is almost exterminated.

The coyotes, from which these mysteries apparently sprang, belong entirely to North America, half a world away, though the stress of existence has driven later generations south as far as Costa Rica in Central America. In common with its island relative, the coyote will burrow; but it packs, it has the true wolf cry on the hunt, and as it is not dangerous to man, except when desperately pressed by famine, it may be regarded as among the natural police of the wilds.

But we must turn to the jackal, which the East calls "The Belly That Runs on Four Feet." Asia and Africa are the home of this industrious scavenger, but south-

eastern Europe still has its jackal packs. There are several species, and all can be tamed, but they are unreliable when grown up. Nearly all wild animals are.

They slink through life as parasites, occupying in freedom much the position that homeless mongrels have in our streets.

They kill birds, young animals, and so on, and they eat anything from a lizard to a banana or a coffee-berry. But they take service with the swaggering tyrants of the wilds. When lion or tiger has made its kill and filled itself, up come the jackals to fight with the gorging vultures for the broken remains. And the curious thing is that where men go out to hunt, these timid and confiding creatures follow, just as they follow the great cats—to snap up anything left by the lord of the gun. They will clear a carcase in a night.

But we must not forget the service they render to towns and villages where sanitation is an unknown science. Holes are left in walls and stockades to enable the jackals to creep through at night. Anything which a jaw can master is food to the scavenger. A saddle or a pair of boots, left out by accident, goes the same way as a skeleton.

Horrible fevers and pestilence arise in such centres of human life, and Europeans die like stricken birds. But what would happen were it not for the loathsome feastings of the nightly jackal brigades?

THE TERRIBLE WORK OF A WOLF WITH 78 CAMELS

Well, these two groups, the wolves and the jackals, have given the world "the friend of man," for they are the ancestors of the dog. What a life of terror our ancestors must have lived when breaking in the enemy of the flock to become the guardian of the fold. Again and again, one fancies, there must have been scenes such as were witnessed in 1906 in a little British camp out in Seistan, on the borders of Afghanistan and Persia. Our party was marking out a boundary amid hundreds of miles of wild, inhospitable country thronged with wild beasts. Jackals and wolves abound there, and as sometimes happens to domestic dogs at home, the jackals were seized with the madness we call hydrophobia. That was bad enough, but the mad jackals attacked the wolves, and those in turn became mad. The natives, fearing that their dogs might be infected, killed them all, and so left themselves defenceless against the raging packs around their homes.

One fearful night, when the wave of animal frenzy was at its height, a pack of wolves attacked the camp, all raving. By some miracle of courage the men in camp beat off the howling terrors, but a worse night and a worse adventure followed. With a wind blowing at 120 miles an hour, a lone, ravening wolf, with madness heightened by the horror of the night, set out on a mission of hate. Before he could be detected he had bounded with blood-curdling howls into the little settlement. He bit like fifty wolves. He sank his envenomed teeth in the flesh of a horse; he leapt into the camel lines. Like an embodied fury he ran from animal to animal, biting each as he came to it so that before he could be killed this one wolf made his foaming teeth meet through the legs of 78 camels.

THE BRAVE TAMERS OF THE WOLF WHO GAVE US THE DOG

Imagine a camp with a horse and about fifty camels mad with hydrophobia! Imagine the fearful potency of the poison borne on the teeth of the one evil-working animal. Well, that staggering little picture from a dark night in Seistan must have had many forerunners during the ages when man lived always in the wilds, exposed to similar dangers. Do we not feel the prouder of our sad-browed forbears for triumphing over such horrors and bringing in from them a dog to help us through the toils and trials of life beneath the stars?

There is one animal which is wolf in name only, and that is the maned wolf, which is a long-legged, foxy-eared wild dog, whose lengthy coat, exaggerated on the back of the neck, suggests a mane which exists less in fact than in the description. Solitary, timid, and inoffensive, this curious animal has Brazil, Paraguay and northern Argentina for its home; and where its borders end those of several small species of fox-like dogs begin.

DOGS THAT EAT FRUIT AND DOGS THAT CATCH CRABS

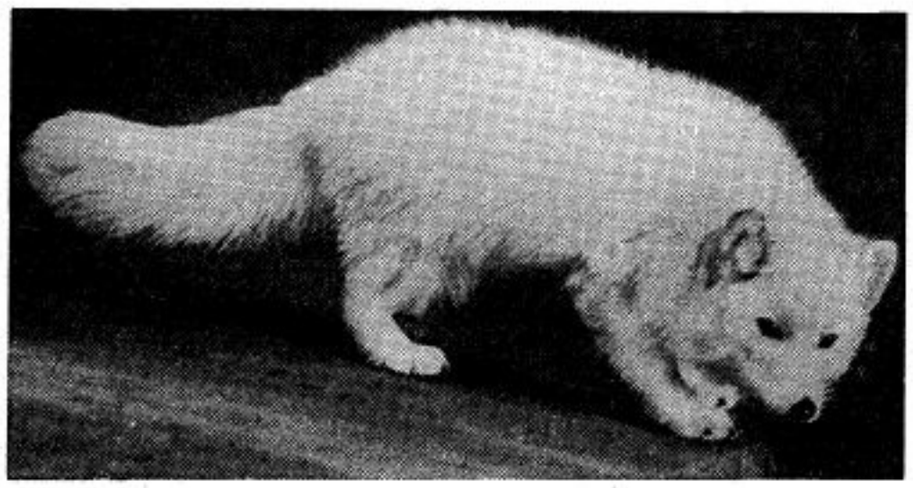
Azara's dog is the title which describes this group. They are commonly called foxes, but they are more allied to wolves and jackals, and range from Paraguay and the Chilean Andes down to Patagonia and Tierra del Fuego, a stretch of territory never yet reached by foxes. These dogs have a diet which embraces fruit, and that peculiarity is shared by several local races

FOXES, JACKALS, & WOLVES OF THE WORLD

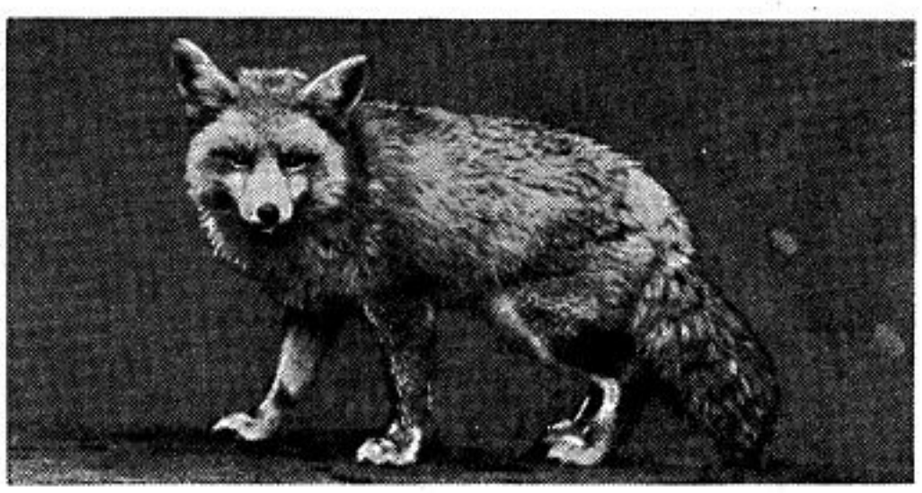
NORTH AFRICAN JACKAL

TIBETAN MASTIFF

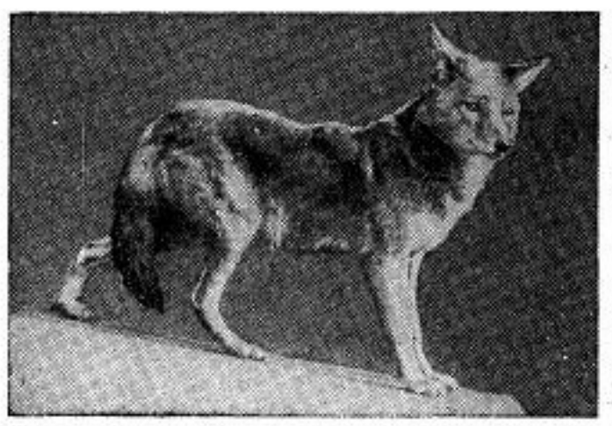
AMERICAN TIMBER WOLF



ARCTIC FOX

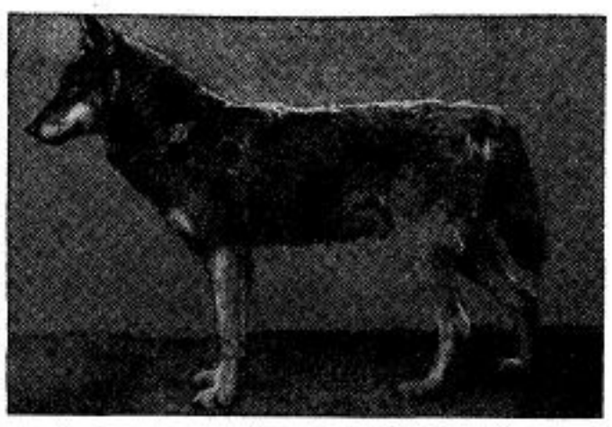


HIMALAYAN FOX

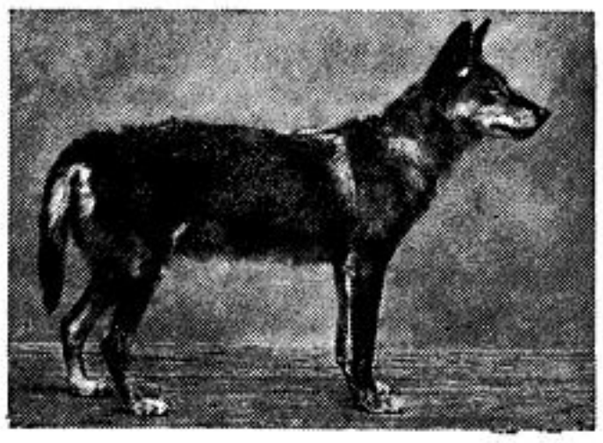


ASIATIC JACKAL

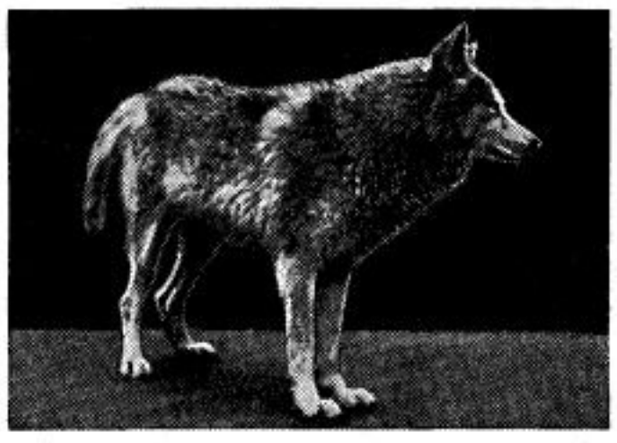
SCARCE WILD DOG OF TIBET



PALAEARCTIC WOLF

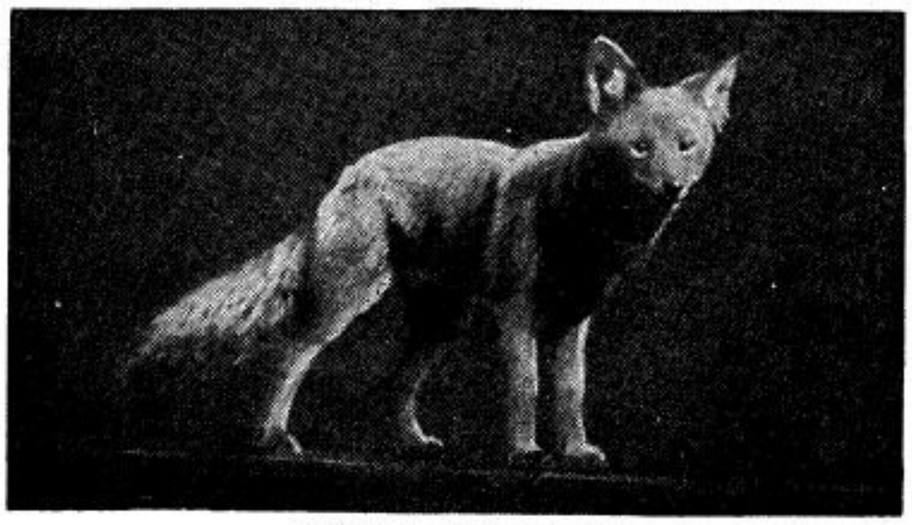


AUSTRALIAN DINGO



WOOLLY WOLF

INDIAN WOLF



CRAB-EATING DOG

COMMON FOX

of South American animals whose crab-catching habits give them the name of crab-eating dogs. These are creatures of the jungle and forest, where another fox-like type, the colpeo, is also to be found. Another fisher of the waters is the raccoon dog, an Old World species wonderfully resembling the raccoon in build, and found in Japan, China, and Amurland. Fish is only part of its diet, and those members of the group which have not this commodity available, sleep away the winter fasting, a unique distinction among dogs.

The true wild dogs are confined to Asia and Africa. The Asian species are big, bold animals which pack and hunt anything that runs on four legs. The African representative of the breed, the African hunting dog, is similar in habit, and runs down the swiftest antelope—an amazing feat, but the species seems to stand among untamed dogs where the greyhound stands among the domestic breeds.

HOW TRICKY REYNARD JUSTIFIES HIS REPUTATION FOR CUNNING

Amid the snows, on the plains, in the forest and jungle, dogs are everywhere, and when we come to Brazil and Guiana, we have specialised dogs, too. These are called bush dogs, extraordinary little creatures resembling badgers, foxes and martens. They are shy and retiring, but very fierce. Though we know little about them, they are an old variety, as we know from fossil remains in Brazilian caves.

Wide as is the range of these animals, the range of the foxes is even more extensive. The fox is at home throughout Europe and Asia, from Ireland to Japan. It is in America and in Africa north of the Sudan and the Sahara desert. As might be expected a great variety of species has developed in widely-differing conditions.

The common fox of Britain is the most astute of all wild animals left to us, and we might feel inclined to attribute its skill and cunning to its long competition with its surrounding foes. But high intelligence marks all the species. How well our British example lives up to its reputation for cleverness we all know. Its tricks to baffle hounds are almost incredible. Crossing a stream repeatedly to destroy its scent, running through flocks of sheep to hide the same fatal clue, leaping from heap to heap of farm produce rather than continue on level ground where its scent would lie, climbing seemingly impossible places, hiding where one would think a rabbit could not conceal itself—in these and a thousand ways agile Reynard justifies his title to exceeding intelligence.

Poultry, game, young lambs and fawns, insects and frogs, are among his food, and his daring in getting his meals is at times astonishing.

THE STOUT-HEARTED LITTLE WELSHMAN AND HIS FORTY MILES RUN

We have more than one variety of fox in Great Britain. There is the common red beauty which we all hate and admire by turn, there is the stout-hearted little Welshman which can cover 30 or 40 miles of mountaineering at a stretch and then escape, and there is the long-legged, fleet-footed masterpiece of Cumberland and Westmorland of whose grandsire John Peel sang his song.

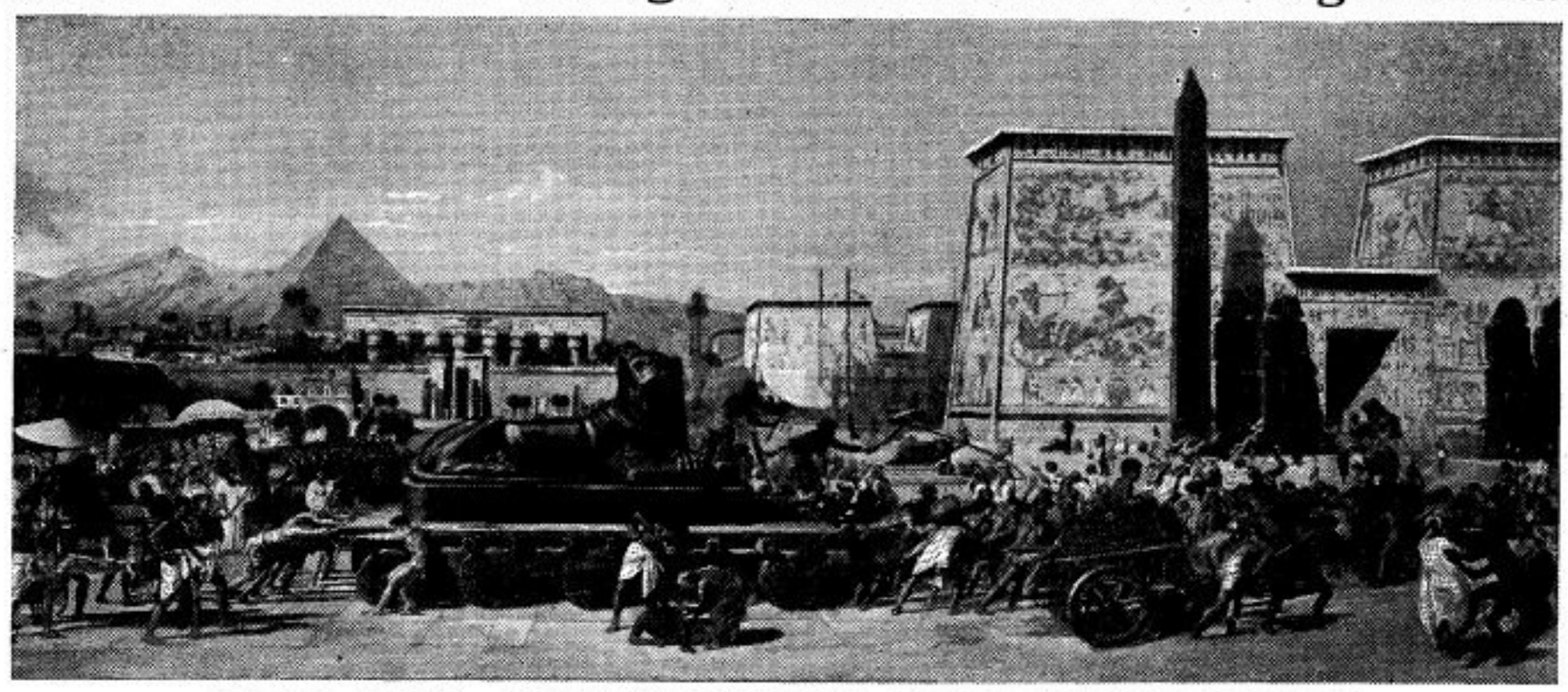
Fruit, carrion, fish, reptiles. birds, and animals which are young and small or enfeebled when adult, yield food to foxes of various sizes, colours and other distinctive peculiarities throughout Europe, India, Siberia, China, and Arabia. Black fox, silver fox, grey fox, the Arctic fox which is blue in summer and white in winter, the little kit fox which runs like the wind, the desert fox of south-western Asia whose entire living depends on the flesh of the gerbils; the corsac fox which is under ground by day and comes out to banquet at night on little rodents of the Central Asian deserts, the neat and nimble little Indian fox fat from a diet of land-crabs, grasshoppers and beetles; the sand foxes and fennecs of Africa which burrow almost as quickly as a dog could dive into water—these are among the species into which the fox family has branched out.

Their origin from a common ancestry is obvious. Their variety of size, colour, homes, and habits is another object-lesson in Nature's way of making animals fit their surroundings. The same consideration applies to the whole dog tribe.

THE WILD DOGS THAT STILL SNAP AT THE HEELS OF CIVILISATION

No race of animals has done more to arouse enmity among men than these members of the family which has given man his greatest animal friend, the dog; for where civilisation marches up to their frontier they live at our expense. There is a constant challenge out to them from men. But they were here before us, they are with us still, and they will continue where they are until towns cover their lairs. There is life in the Dog Tribe yet.

The March of Man from the Age of Barbarism to the League of Nations



Israel in Slavery—By Sir Edward Poynter, from an Autotype photograph

MAN BEGINS TO THINK OF GOD

THE most bewildering fact in the history of the human mind is the spring it suddenly makes in times of great crises toward a grandeur and even a sublimity which seem so out of reach for normal people as to be almost non-human.

We talk about the Evolution of man, and that useful but dangerous phrase tends to make our thoughts false to the everlasting records of history. We think of a savage slowly emerging from the complete darkness of ignorance to the light of the present times, his orderly and unbroken evolution checked only by war and disease.

This is a wholly wrong idea. There is no smooth line of progress from savagery to civilisation. It is not even a spiral of ascent and descent. It is a thing indescribable by a phrase of any kind. Far back in the mists of antiquity there were men greater than any man of the present time, and even in the history of our still youthful Europe we look back to periods of grandeur in architecture, poetry, painting, and music which we are convinced will never be excelled.

Therefore, let us think of the development of the human mind as a wonderful part in the spiritual mystery of existence, guarding ourselves from thinking of it as anything mechanical, or anything which can be wholly controlled by the schoolmaster and the statesman.

The incident of the Hebrew slaves who escaped from Egypt and made their way into Syria will help us to think more correctly of the history of man's mind.

These people had a feeling for nature unknown among other nations. They loved beauty; they felt the glory of the Earth in their blood like a passion. Moreover, they had ideas about human life which were altogether superior to those of other people. Slaves they had been, and slaves of a nation so sunk in superstition that it placed food and raiment in the graves of its dead, that they might not be hungry or naked in the next world. Yet these slaves, sweltering in the Egyptian sunshine, and cowering under the lash of their cruel taskmasters, cherished in their minds an idea of the world nobly grander than that of the Egyptians who despised them.

How are we to account for this? Whence came to the Hebrew slave his idea of one supreme God, ruling the whole universe, *and making for righteousness?* We can only answer that he was inspired. As Shakespeare was inspired above all other poets, and Michael Angelo above all other sculptors, and Handel and Beethoven above all other musicians, so

the Hebrews were inspired above all other nations in the truth of the universe.

By some power of which we have no knowledge, they broke the heavy chain which bound the soul of man in the prison-house of superstition. They took a leap in history which has never been equalled since. At a single stroke they flung off the craven fears of the Egyptian and all the dark forebodings of man's past, and stood up in the hills of Syria, singing songs of liberation and joy, as though conscious of the presence of God.

THE HEBREWS GIVE UP GRAVEN IMAGES AND WORSHIP THE TRUE GOD

Think for a moment of such utterances as this, " The morning stars sang together, and all the sons of God shouted for joy " ; or, " Love thy neighbour as thyself " ; or, " Man doth not live by bread alone " ; or, " The heavens declare the glory of God ; and the firmament showeth His handywork"—marvellous phrases all these in those far-back days.

The Egyptian had worshipped animals ; other nations around them had worshipped gods made half in the image of men and half of animals ; almost all these gods were horrible, repulsive, and contemptible. But the God of the escaped Hebrew slaves was the Power in the universe which was working for righteousness, and so sublime was He, so glorious beyond all human imagining, that they would suffer no one to make an image of Him.

This absence of any graven image in the ritual of the Hebrews made an enormous difference to the history of the human mind. It drove the Hebrews to an *inwardness* which we now know to be the rock and strength of all true religion. Their religious thoughts were always turned inward upon themselves. " The righteous God trieth the hearts and reins." God was no idol made with hands, but a Spirit who read the secrets of the heart, and the demands of God were the demands of morality—no murder, no stealing, no lying, no envy, no mutiny in the heart, the home, and the nation.

THE HIGHEST WORSHIP IS TO LOVE RIGHTEOUSNESS AND WALK NOBLY

Thus could they best worship Him—by loving righteousness and walking uprightly. He had chosen them ; they were to enlighten the world ; through them the Earth was to be blessed and all the nations brought into the way of peace. Note in particular that the Hebrews laid stress on the reality of this divine Power by speaking of Him as the *living* God. They felt his presence in the loveliness of the Earth and His voice in the whisper of their own conscience.

Remember that all this was a sudden uprush of the human mind into spiritual consciousness. It had not been prepared by other nations. It was not a mere development. It was not something the Hebrews had picked up here and there, and so pieced together. In no literature of past times is there anything in the least comparable with the ancient scriptures of these extraordinary people—these Semitic tribes spreading themselves over Palestine, fighting their enemies like barbarians, practising cruelties which shock and appal us, plunging into a racial vanity which disgusts us ; but all the way through their astonishing history holding up to the gaze of mankind the idea of a living God whose concern was the moral law.

MOSES THE FIRST HEALTH MINISTER AND THE FOUNDER OF SANITATION

Remarkable, too, is the fact that in the beginning of this wonderful religion the idea of immortality had no place. The Israelite was told to act rightly for the sake of rightness, not in the hope of entering heaven or escaping hell. It is true he was taught that righteousness brings a blessing here upon Earth, but the best of these Hebrews held that righteousness was its own reward, and one of them exclaimed, in words which are now known throughout the whole world : " The Lord gave, and the Lord hath taken away ; blessed be the name of the Lord ! " and " Though He slay me, yet will I trust in Him."

This spirit, so marvellous in a primitive people recently escaped from slavery, did not confine itself only to the contemplation of the divine Majesty. The Hebrews became the first nation seriously to perceive the immense importance of health. In them we find the fountain head of the whole science of sanitation. Moses, it has been said, was the really first great health statesman.

Again we must stop and strive to put out of our heads the thought that we are reading a history of the Israelites. Again we must remind ourselves that we are studying the history of the human soul. We have seen that soul waiting for its prey with stone and cudgel ; we have seen it leaving the forest for the cave, the cave for the town ; and we have seen it watching

the stars, observing the seasons, investigating the mysteries of the Earth, inventing language and writing, becoming husbandman, astronomer, artist, author, and physician; and finally we have seen it cowering before death, trembling at the sound of thunder, and offering up pitiful sacrifices to the fearsome gods who seemed to be bent on its destruction.

THE SOUL OF MAN FLINGS OFF THE CHAINS OF SUPERSTITION

All of a sudden, and in a place where it might least be expected, this soul of man rescues itself from superstition, flings off the chains of slavery, feels itself to be in the hands of a righteous God, and bursts into songs of gladness which have never been excelled in any religion of the world.

At the same moment, too, the soul of man becomes enthusiastic about personal cleanliness, and breaks away, not only from the spiritual defilements of slavery and superstition, but from the physical defilement of uncleanness. Moral law becomes supreme over human life, the home becomes a centre of instruction and deep love, disease is fought with the intelligence which recognises in cleanliness a great ally.

It is a jump into the future. It is as if Life had felt itself imperilled by the worship of superstition, checked by the hard and fast rules of the priests, and had found in these strange Hebrew slaves an opening for one of those tremendous springs forward which, in times of stagnation, save humanity from slipping back into the barbarism of the past. Along Egyptian lines there was no hope of progress, and a grave danger of falling back; but in Israel there was this opportunity for a plunge ahead, a dash toward the future, which would save mankind from the fearful risk of moral downfall and a return to primitive savagery.

THE AMAZING MOVEMENT OF MIND IN THE DAYS OF MOSES

However we may try to interpret it, certainly there was a movement of mind in the days of Moses which will for ever fill the student of history with amazement. If you would see how a student of history feels about this astonishing spiritual uprush, glance at the headlines of a daily newspaper, particularly a Sunday newspaper, and then read the 38th chapter of Job, the 103rd Psalm, and the 53rd chapter of Isaiah. It will seem to you that the newspaper must have been printed in a barbaric age, and that the other words are the final utterance of the highest spirits of the human race.

Glorious and incomprehensible as was this tremendous movement of the mind, tragedy was to overtake it. The mass of the Israelites kept the sanitary law, and remained true to the idea of one supreme God; but the passion of this first impulse went from them, they became formal, and they set their thoughts more on earthly well-being and comfort than on direct spiritual experience.

Some seven hundred years before the birth of Jesus the kingdom of Israel fell before the sword of Assyria, and the ten tribes were again carried off into slavery. Two hundred and fifty years later the kingdom of Judah fell to Babylon, and never again was Palestine to be free from an alien despotism.

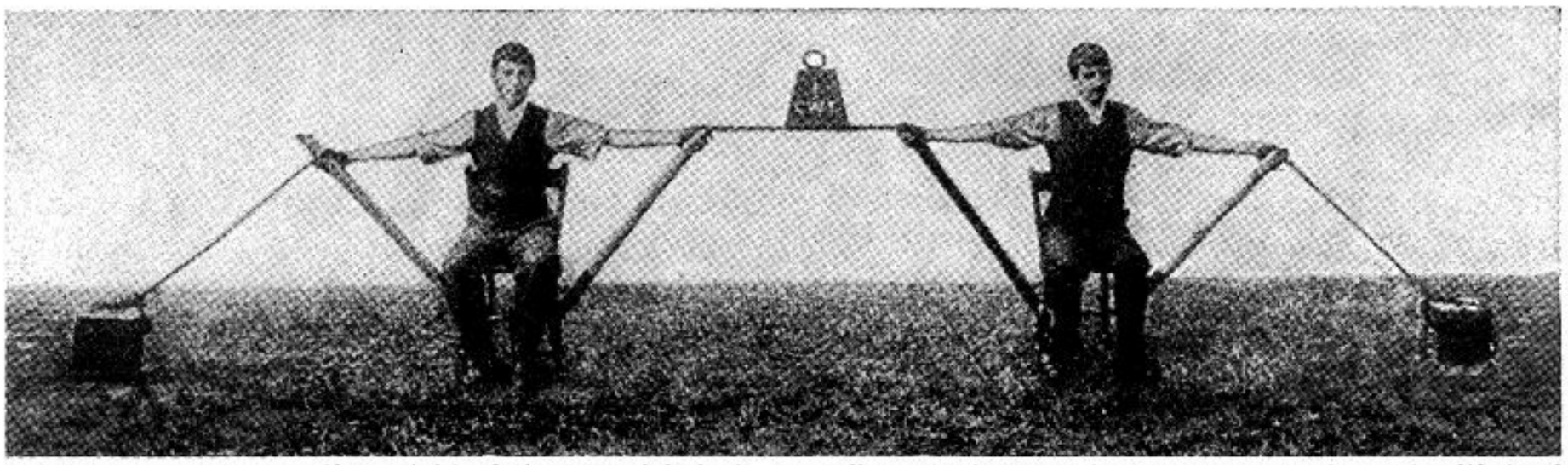
THE IDEA THAT WAS TO LEAVEN THE LIFE OF ALL MANKIND

But Life is concerned with the mind of man, not with empires and kings, and in Israel it had made a contribution to the history of mind which is immortal. Henceforth the idea of one supreme God was to leaven the life of the human race, the thought of righteousness was to inspire all the greatest of mankind, and to give a new beauty and a rich content to family life, while the notion of cleanliness was to work like magic in the sphere of science and to make huge cities like London a possibility of the future.

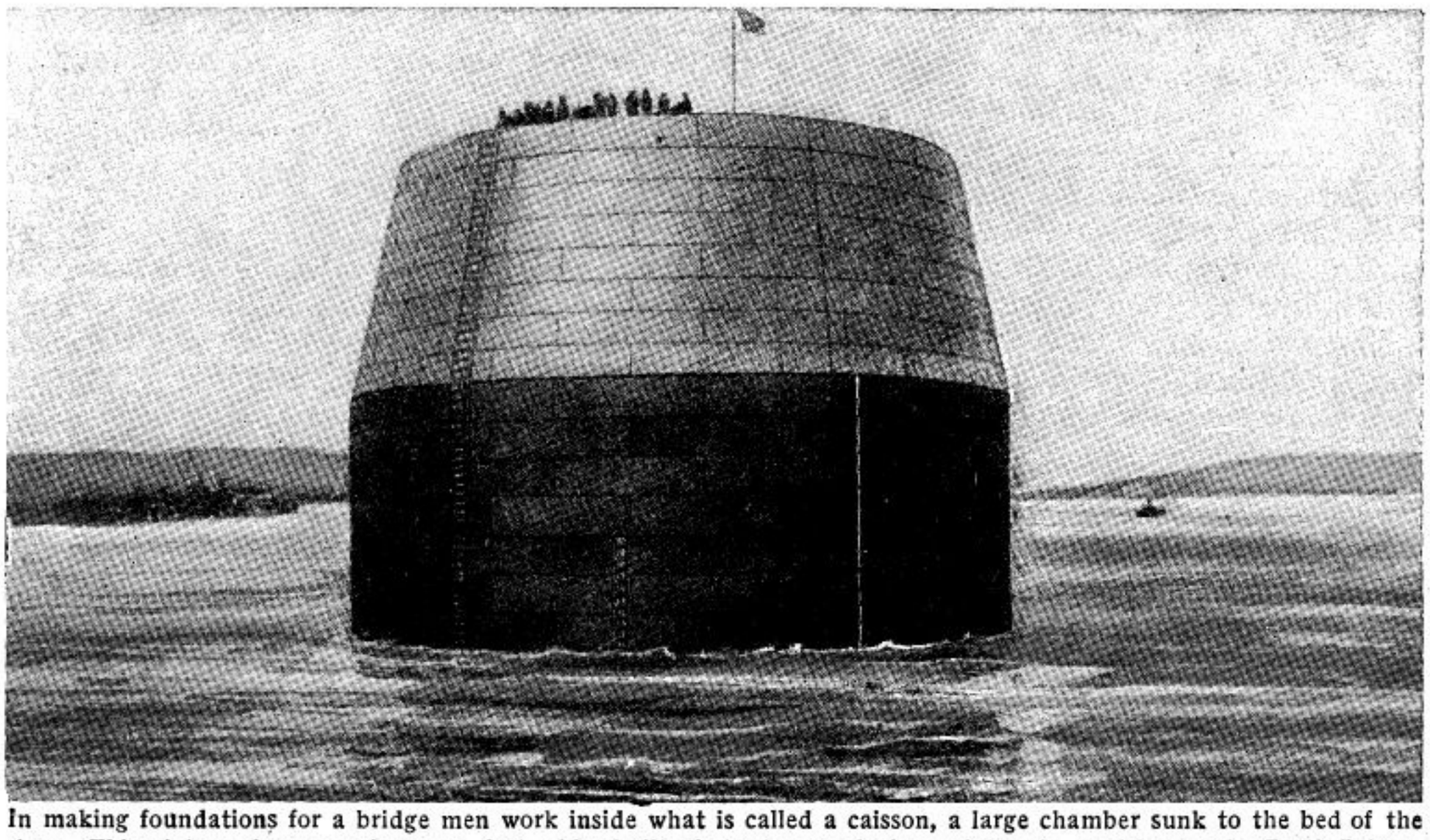
Let us make it an immovable part of all our thinking that a little body of slaves from Egypt, suddenly inspired by the beauty and majesty of the Earth, held fast the idea of a Power in the universe which made for righteousness, found in the worship and adoration of this invisible Power a strength and gladness hitherto unknown among men, and burned into the consciousness of the human race a sense of moral law which continues to operate to this day.

Such a sense of the Divine, present constantly in our inmost thoughts, will give to our lives a dignity they must otherwise lack, sustain us with loftier hopes, shape our conduct when inherited faults assail us and, if it be widely felt, will have a social influence causing us to live in happier concord with our neighbours, and in peace and mutual helpfulness as members of different nations.

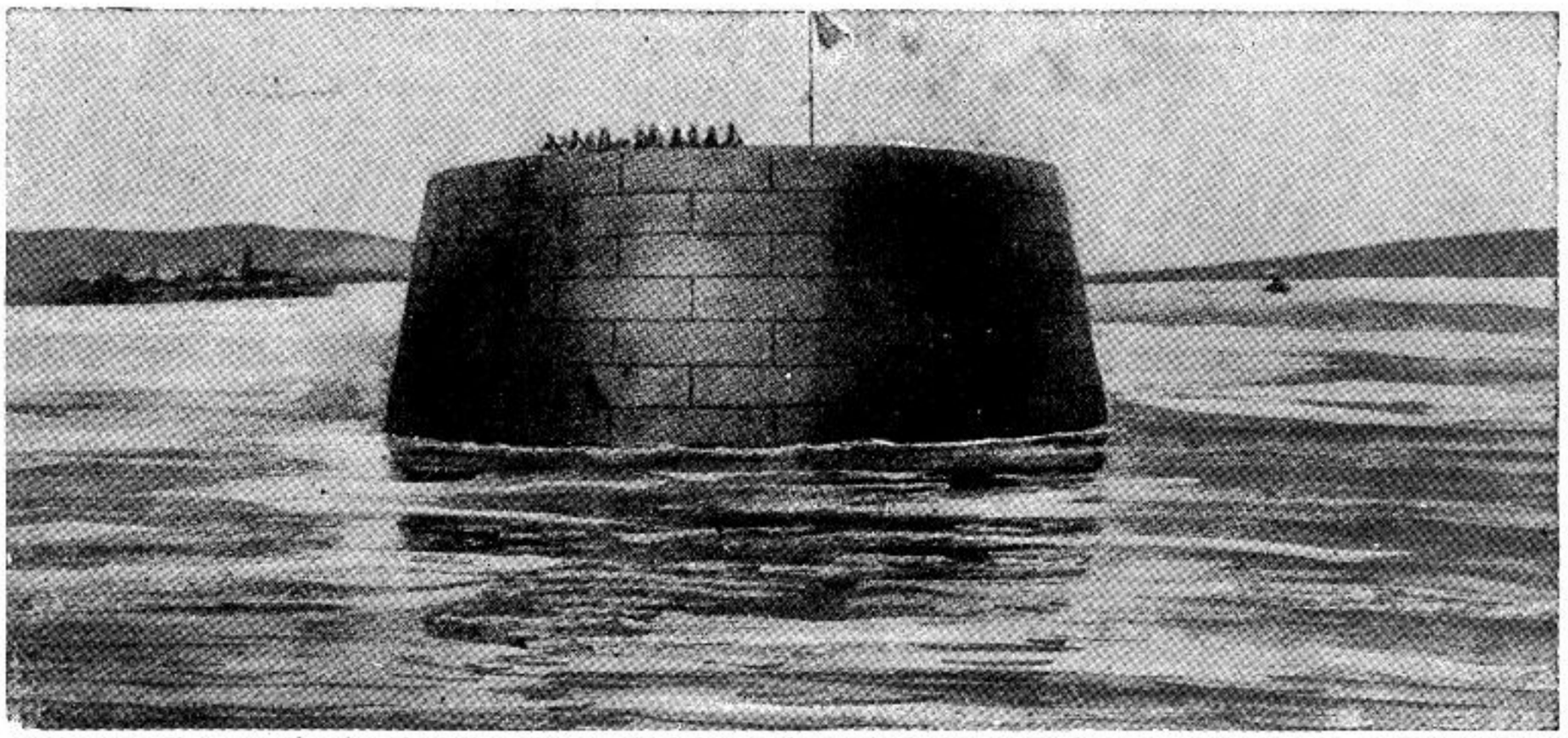
THE BRIDGE WORKSHOP DOWN IN THE RIVER



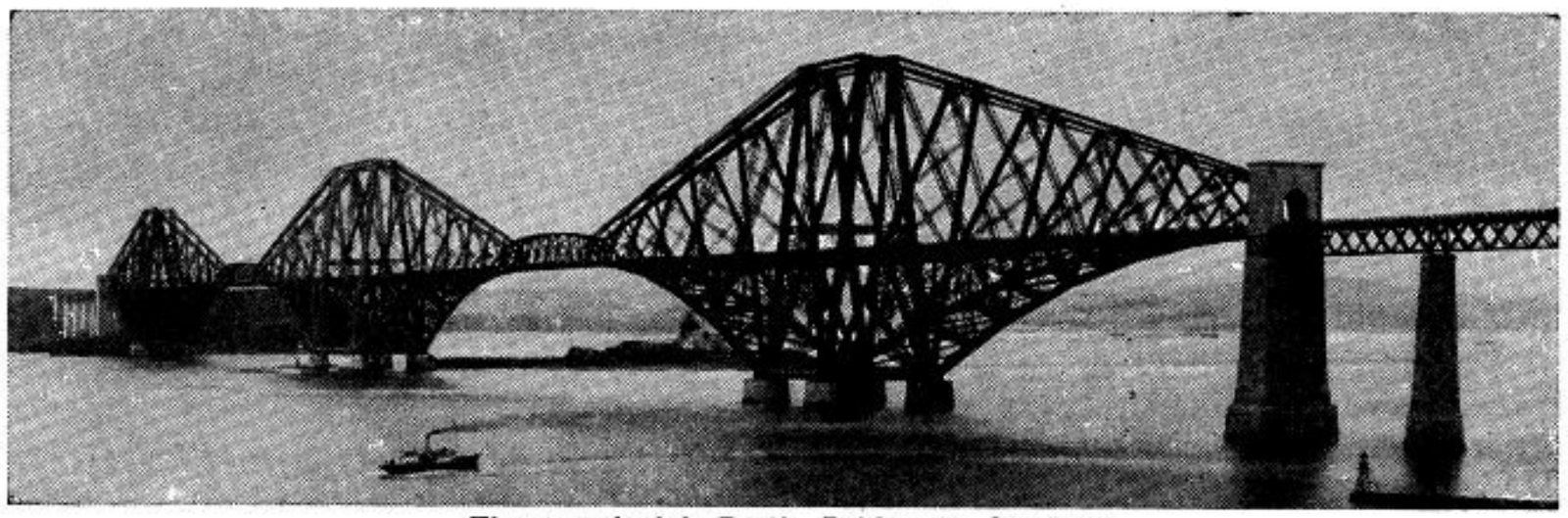
A bridge must support the weight of the materials in it, as well as the loads it has to carry, and it must withstand snow, wind, and storms. What we call the cantilever in bridges is simply an overhanging bracket which would tend to overturn; but if two cantilevers are built out simultaneously from opposite sides they will counterbalance one another. Each of the sitting men here represents a double cantilever. The outer sticks are tied to weights and cannot collapse inwards, and the inner sticks fixed to the chairs support a board the weight on which is equally distributed, and so easily carried.



In making foundations for a bridge men work inside what is called a caisson, a large chamber sunk to the bed of the river. This picture shows a caisson 70 feet wide, built of stout wrought-iron plates, in position at the Forth Bridge. At the bottom of the caisson is a working chamber seven feet high, lighted by electricity and filled with compressed air.



As the men dig away the river bed the caisson, which has a sharp steel edge at the bottom, sinks into it, and more plates may have to be added at the top to keep the water out.



The wonderful Forth Bridge in Scotland

FOOTPATHS IN THE AIR

No one can say who built the first bridge. Nature herself would no doubt be man's first teacher. Man would find a path across a chasm by clinging to a twisted vine; or he would see a ready-made bridge consisting of a fallen tree-trunk lying across a stream. Those were the first bridges, and they were the sort which were made for hundreds of years.

One day a genius arose who dumped high heaps of stone in a line across a stream, and on the top of these placed slabs of slate or stone or fallen trees. Then, a long, long while afterwards, came bigger, real bridges. The Romans were the first to learn how to make these. They built splendid bridges on arches, some of which exist today.

Men had a long time to wait before they got good bridges in England. The twelfth century had almost ended when the first great London Bridge was built. There were wooden houses and shops on it, but these often caught fire and damaged the bridge, and they were all pulled down before the bridge was destroyed.

A great reform was made in bridge-building by John Rennie. It had been customary to make the arches very high, so that the roadway sloped very sharply up on one side, and very sharply down on the other. But John Rennie made his arches, not like the half of a circle, but in the shape of an ellipse, that is, a flattened half-circle, something like the half of an egg, cut lengthwise.

There still exists a famous single-arch bridge of the old type, the famous bridge at Pontypridd, in Glamorganshire. The first bridge there had three arches, but the river washed them away. Then the builder, William Edwards, put up another in its place, but it had only one arch, and the bridge soon fell in.

Edwards discovered the cause of its fall. There had been too much weight on the supports, and not enough in the centre. By being too light on top, the crown of the bridge was forced up and made to fall. Then he built a third bridge in which the haunches were lighter and the top heavier. That bridge still stands, after nearly 200 years, and it is now preserved as an ancient monument.

When the eighteenth century was drawing to a close men began to build bridges of cast iron. But engineers soon found that, though cast iron can bear great pressure, it will not bear much *pull*. It cannot be easily crushed by a weight, but it can soon be snapped by weights which pull at the two ends. So they then used wrought iron, which cannot easily be pulled apart. That served until steel came into use in the nineteenth century.

The first great bridge built of wrought iron was the Britannia Bridge, which crosses the Menai Straits in North Wales.

The builder was Robert Stephenson, son of the famous George Stephenson who made the Rocket. He made a huge square tube of iron—iron at the top, iron at the sides, iron at the bottom, and through this tube of iron the trains pass. To increase the strength of the bridge he made the iron at the top and bottom tube-shaped, instead of solid, because it would better stand the pull of the weight.

THE IRON TUBES IN WHICH THE TRAIN CROSSES THE WATER

These tubes are built on huge columns of masonry, one being founded on an island half-way across the water, and the others on the land at the sides. As ships were constantly passing, it was impossible to put up great scaffolds on which to build up the ironwork. So Stephenson had the two tubes, nearly 500 yards long, built in four sections on shore. When all was ready the big tubes were floated on many boats, and ferried out to the towers.

As the tide went down the boats gradually sank, and the tubes, weighing 5000 tons each, came to rest in grooves prepared for them in the masonry. Then the boats were drawn away and the enormous masses of iron were hoisted up to the proper height, 100 feet above the water, by great engines.

The finest of all bridges is the great steel cantilever bridge. A cantilever is copied from the oldest of simple bridges. If two trees lean over the water from different sides of a stream we have only to run a plank from the end of one trunk to the end of the other, to make a simple cantilever bridge. That is one way of applying it. The other is to consider the cantilever a bracket. Secured firmly at one end, a bracket will bear a shelf with a heavy weight of books, and the steel cantilevers forming a bridge are merely huge brackets. The best example is the great Forth Bridge.

THE GREAT BRIDGE-BUILDER WHO DIED BROKEN-HEARTED

There had been many schemes for bridging the River Forth, and at last the work was begun by Sir Thomas Bouch, who had built the famous Tay Bridge. But suddenly, one dreadful night in the winter of 1879, part of the Tay Bridge was blown down, carrying with it into the river a trainload of people. Everybody in the train was drowned, and the country was horrified. Sir Thomas Bouch died broken-hearted, and the Forth Bridge was designed by Sir John Fowler and Sir Benjamin Baker.

They had to cross two swift channels of water. There is an island in the middle, but on each side of it there flows a channel of water deep and swift, and 1700 feet broad. It was impossible to sink piers in these channels, so the central pier was founded on the island, and two others built nearer the shores.

The cantilevers, of which there are three pairs, carry the bridge across the two wide stretches of water. Each pair is 1360 feet long, and the three, stretching out toward each other, leave a space of 350 feet to be covered between the ends of the first and second, and a similar space between the ends of the second and third. Here ordinary steel girders are used. In order that ships may pass under it, the bridge is made 150 feet above high tide, and the top parts of the structure are 360 feet above the water.

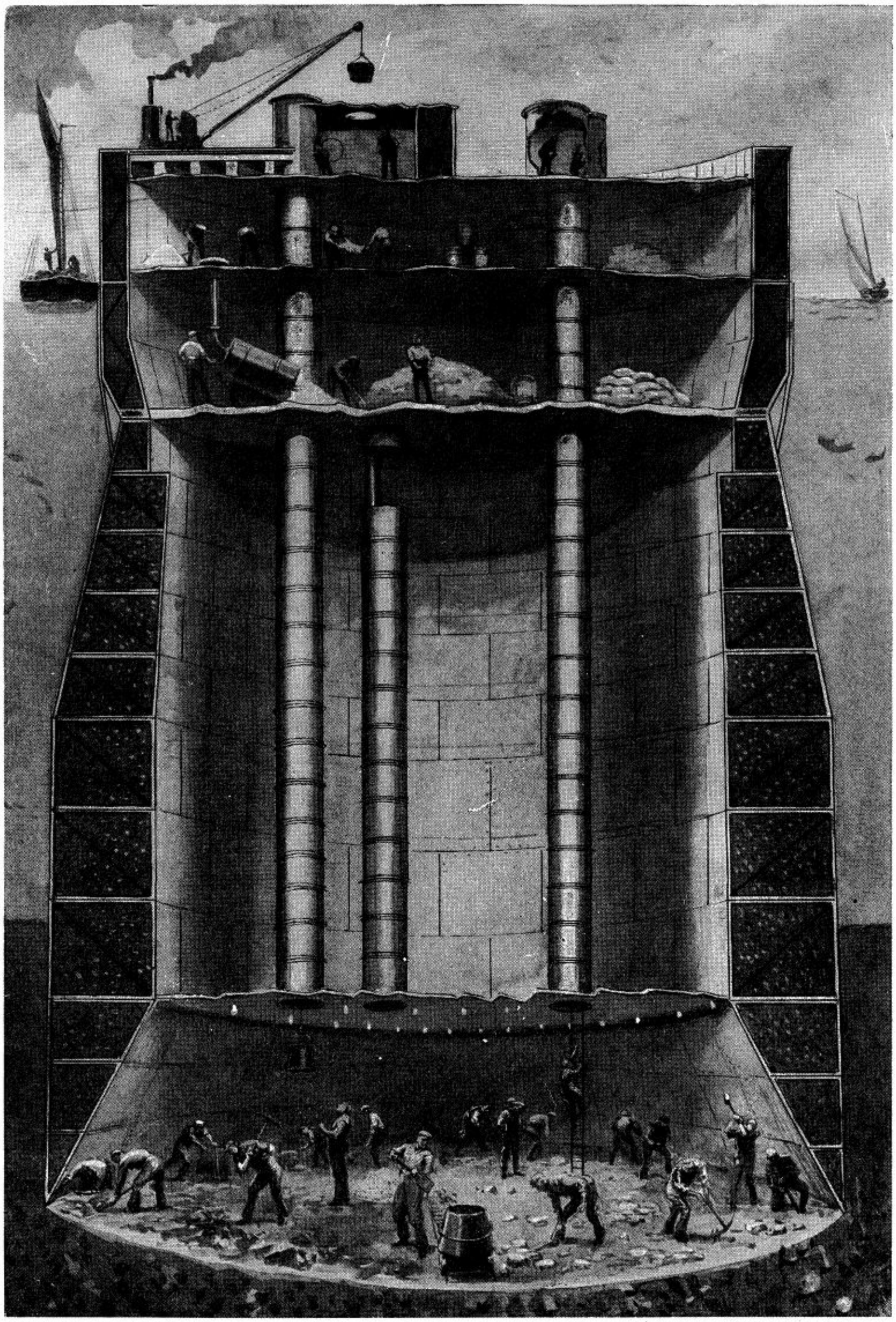
The cantilever-bridge plan has since been used for many other bridges. One on this plan crosses Niagara at a great height above the water. The cantilever is used in suspension bridges also. Huge columns are erected on land, and from them chains or wire ropes are stretched across the gulf, carrying a roadway.

HOW KITES AND ROCKETS ARE USED FOR BUILDING BRIDGES

The best suspension bridge in England is at Clifton. This is 702 feet across, and 31 feet wide. It is more than 200 feet above the River Avon, and it is said that the first string attached to the rope which pulled across the cable was sent over by means of a kite.

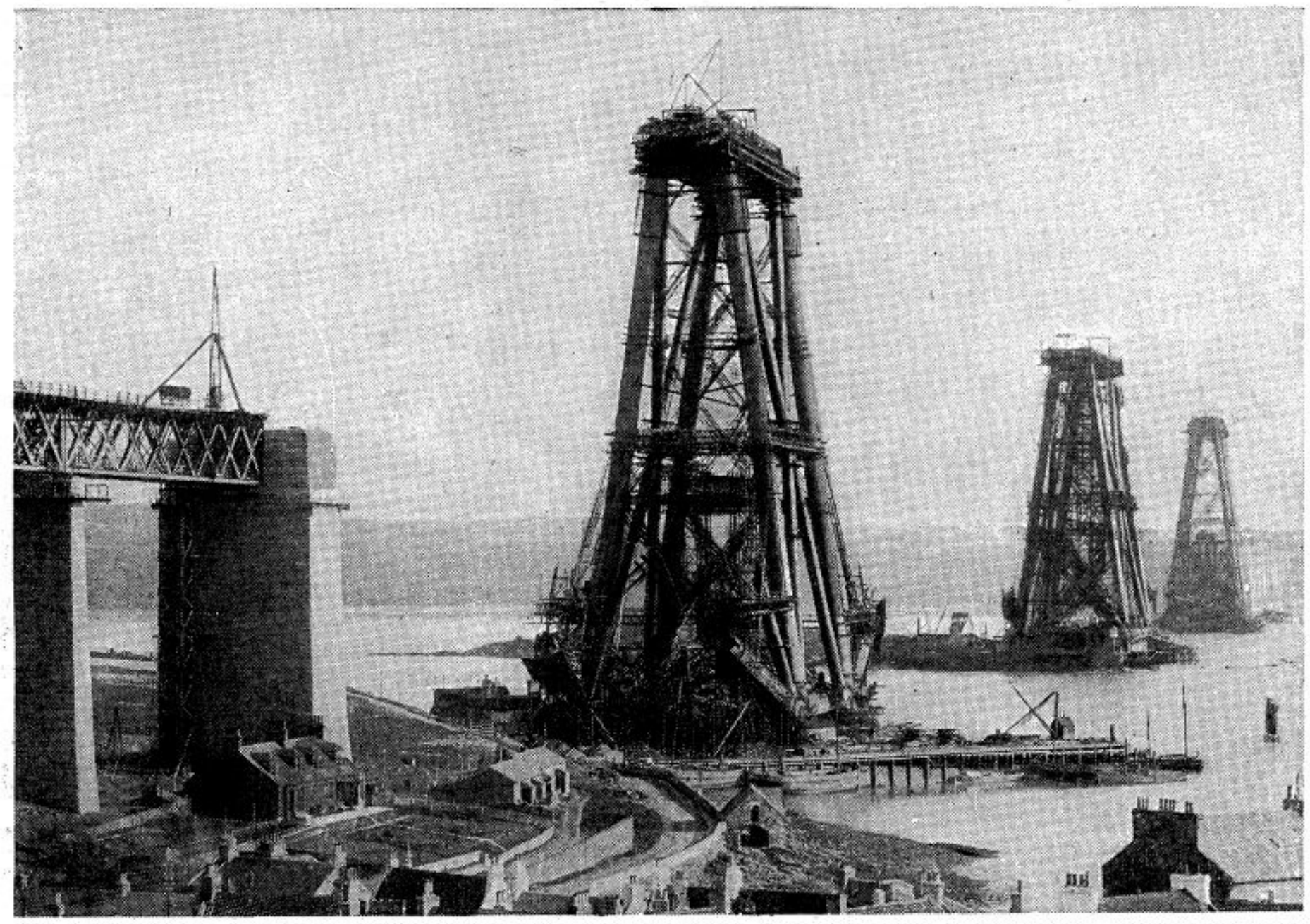
A still stranger way was adopted for starting a great bridge across the River Zambesi, in South Africa. The bridge is the highest in Africa—420 feet above the water, and runs from cliff to cliff; so they had to fire a rocket fastened to the end of a cord. The rocket took the cord across, the cord was used for hauling across a wire, and the wire was used to pull over a small cable. On this a truck was sent across carrying the main cable of the bridge, which is over 200 yards long, and one of the greatest engineering wonders in South Africa.

The great bridge which crosses Sydney Harbour in Australia is one of the engineering marvels of our time. It has a massive steel arch with a span of 1650 feet to support the track across the harbour, and the bridge cost nine million pounds to build.

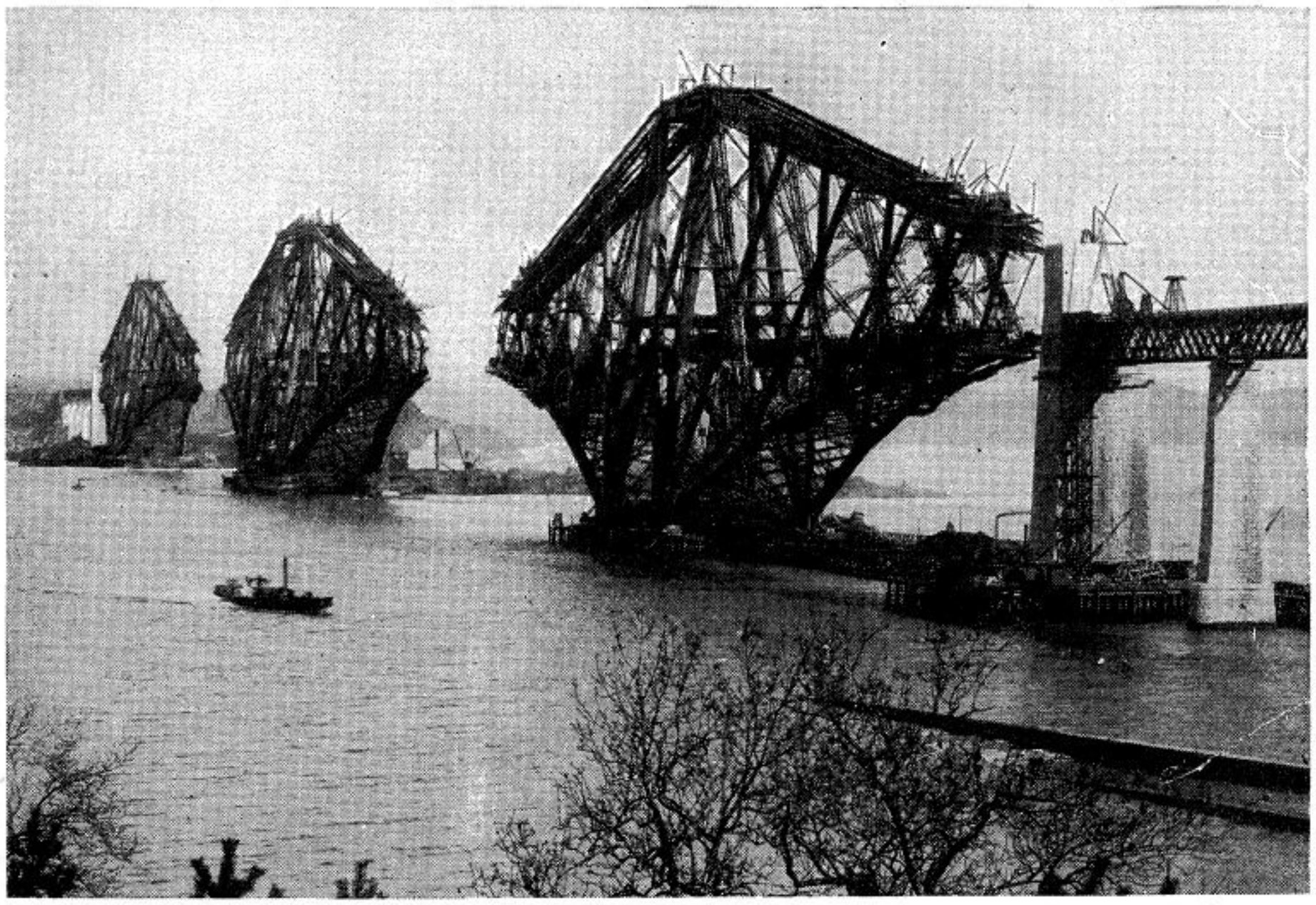


Here we see how the Forth men worked inside the caisson shown on page 546. Mud was diluted with water and blown out of the caisson by compressed air; clay was hauled out, and when a firm foundation was reached, nearly 90 feet below water level, the caisson was filled with concrete, and on this solid base the massive stones of a pier were laid.

BEGINNING OF THE GREAT FORTH BRIDGE

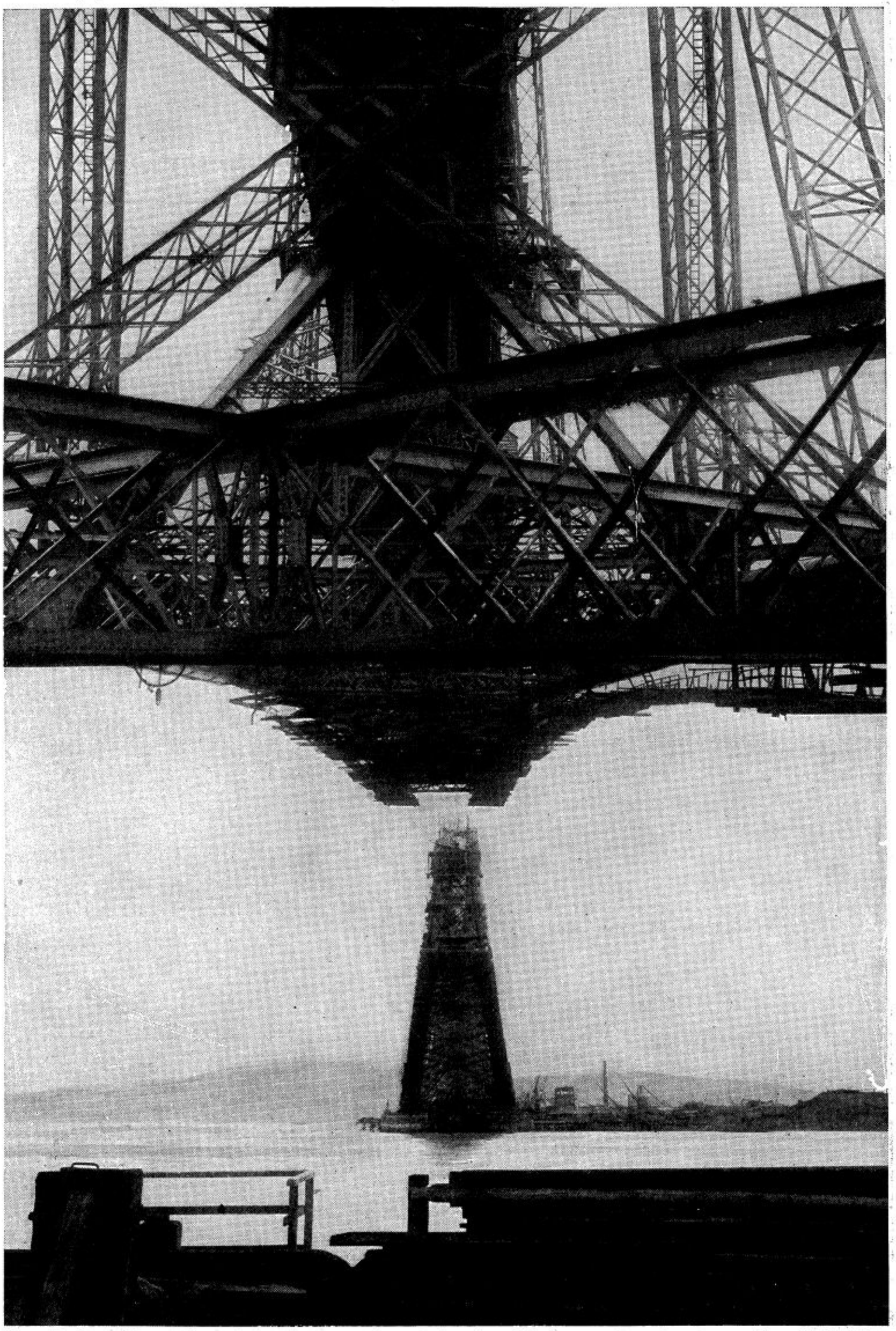


The Forth Bridge, designed by John Fowler and Benjamin Baker, marked an epoch in the history of bridge building. Over 1½ miles in length, it took seven years to build and cost nearly £3,000,000. Three main piers, each consisting of four circular masonry supports built upon a caisson, carried pillars of hollow steel 360 feet high and 12 feet in diameter, bolted down to each support with 48 steel bolts 2½ inches in diameter and 24 feet long.



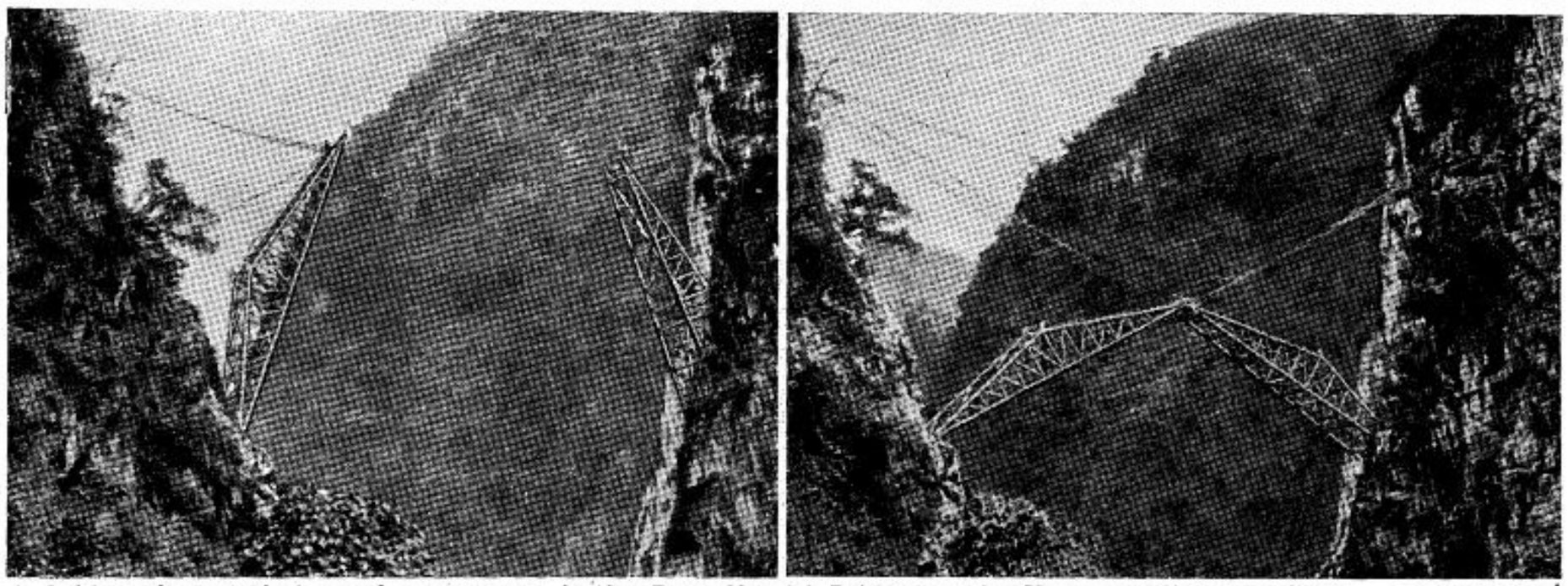
From these pillars the bridge was gradually built out, over 50,000 tons of steel and 140,000 cubic yards of concrete and masonry being used. The two great openings have each a span of over 1700 feet, or nearly one-third of a mile, and offer a clear headway for ships 150 feet above high water for a width of 500 feet.

MASSIVE ARMS FLUNG INTO SPACE

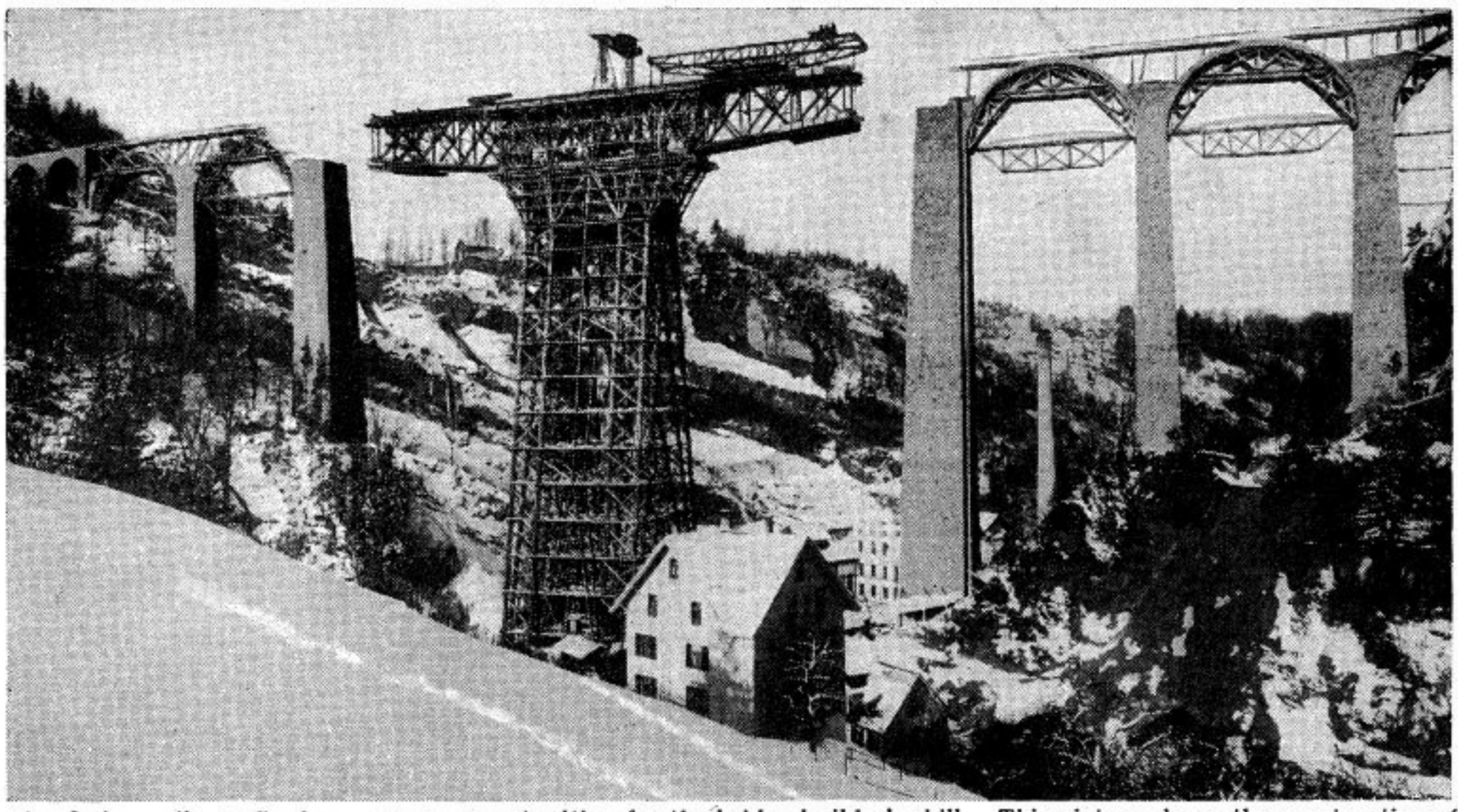


From the base of a cantilever, below the hammering and clanging of the busy workers above, we see the mighty lattice work creeping out unsupported over the estuary. The Forth Bridge was opened in 1890, and on the principle of its design nearly every long-span bridge throughout the world has since been built.

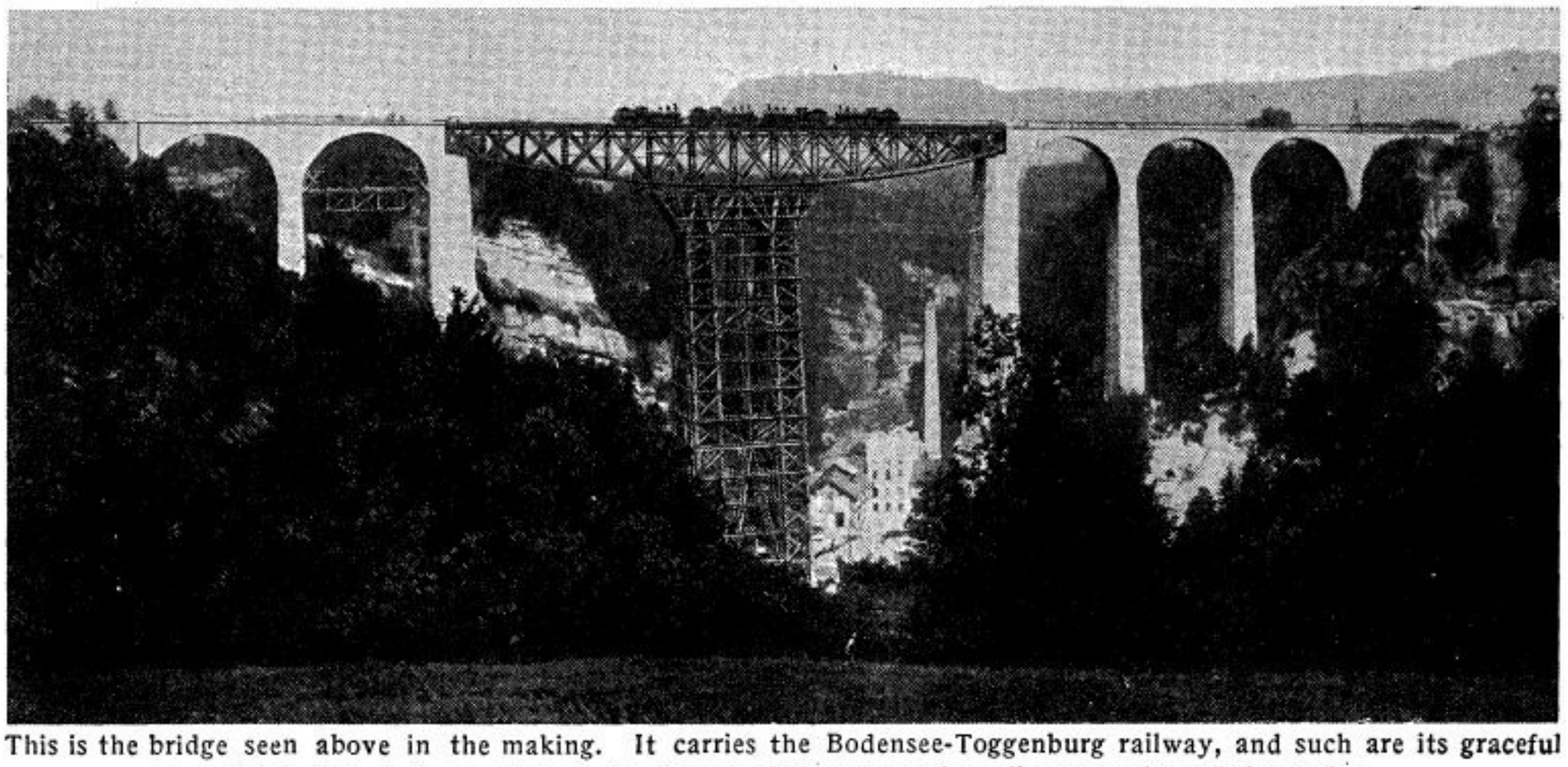
LOFTY BRIDGES OVER VALLEY AND RAVINE



A bridge of somewhat novel appearance is the Faux-Namiti Bridge on the Yunnan railway in China. It is 220 feet long, spans a wedge-shaped fissure 350 feet above the water, and is approached on each side through a tunnel. In building it a bascule was lowered from each cliff-face by cables and winches, as seen in the first picture, and French engineers then made the connection at the centre. With these bascules as supports the railroad was laid across.

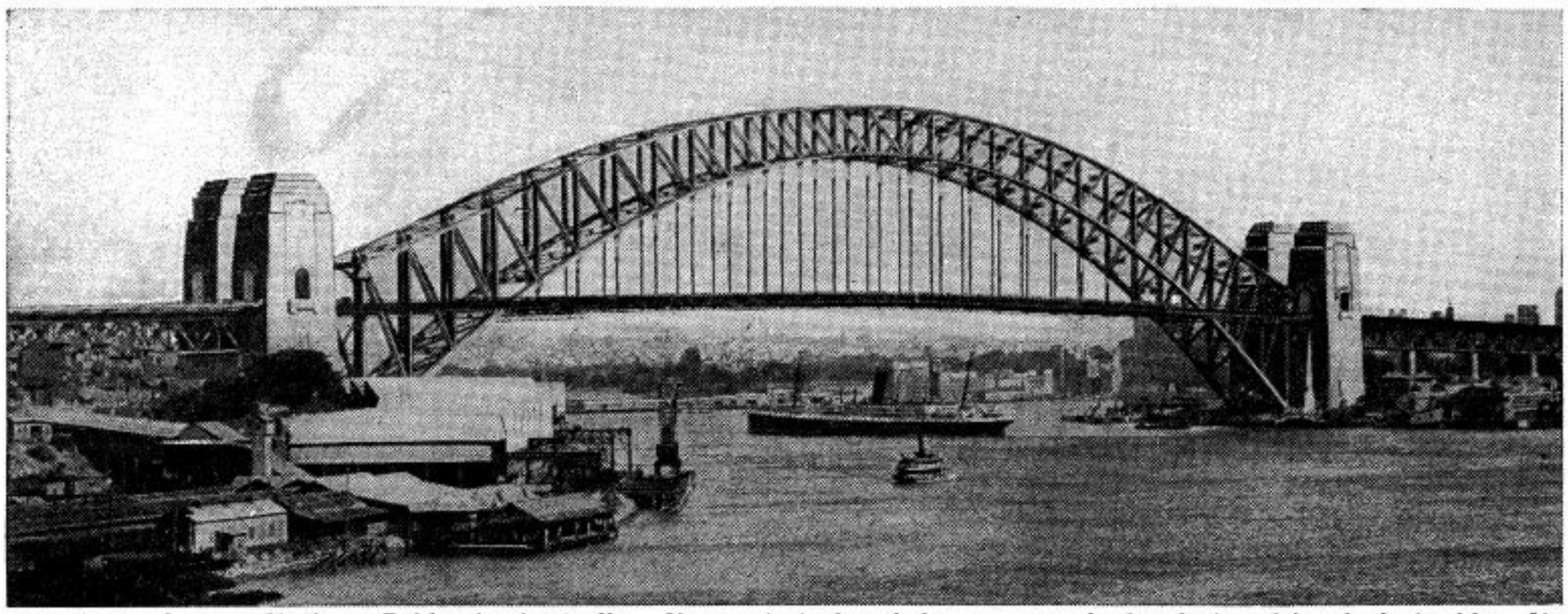


The Swiss valleys afford numerous opportunities for the bridge-builder's skill. This picture shows the construction of a viaduct (seen below) across the Sitter Valley, near St. Gall, Switzerland, with a column of scaffolding 300 feet high.

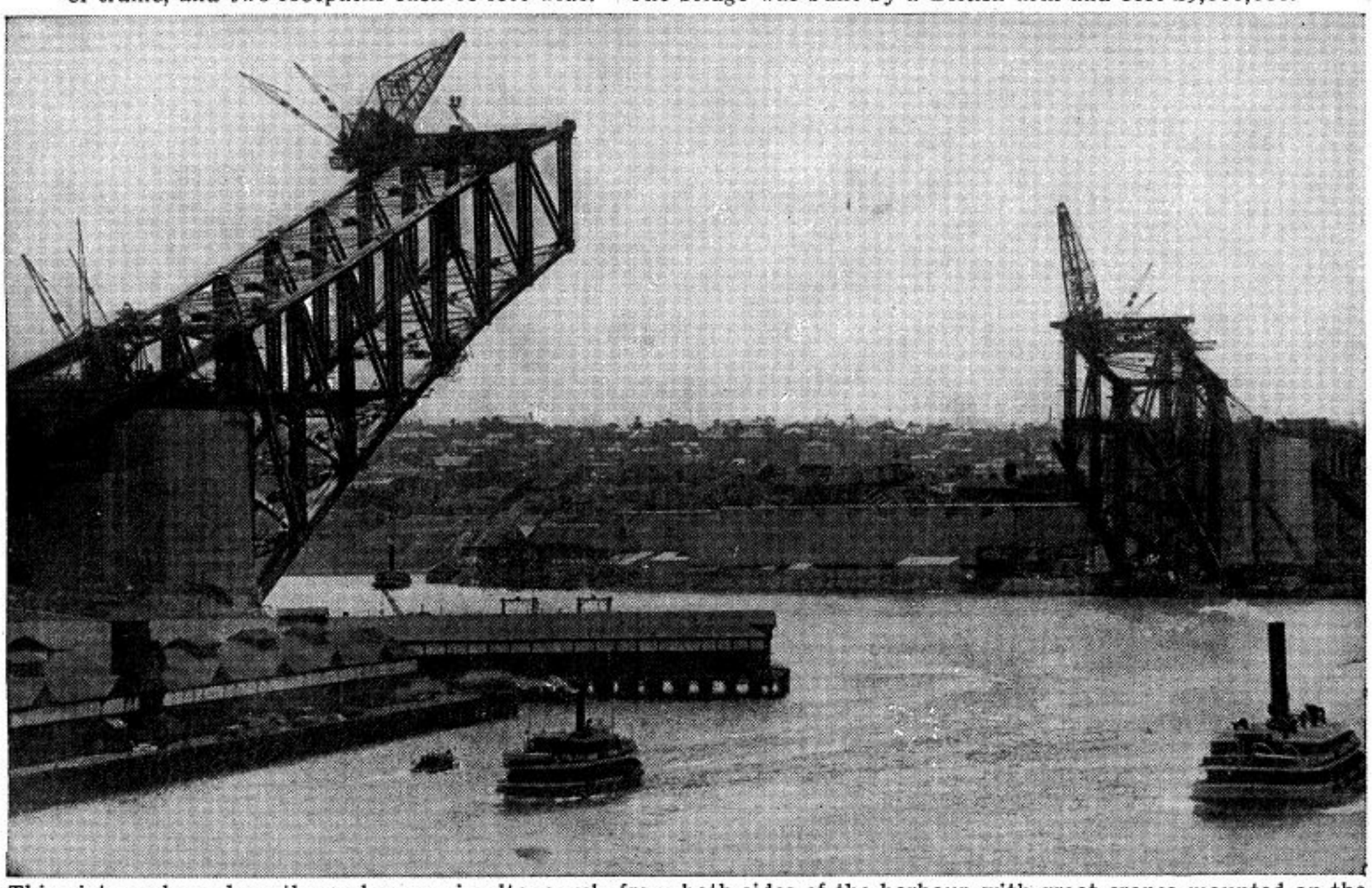


This is the bridge seen above in the making. It carries the Bodensee-Toggenburg railway, and such are its graceful proportions that it does not spoil the beauty of the mountain valley seen through its arches.

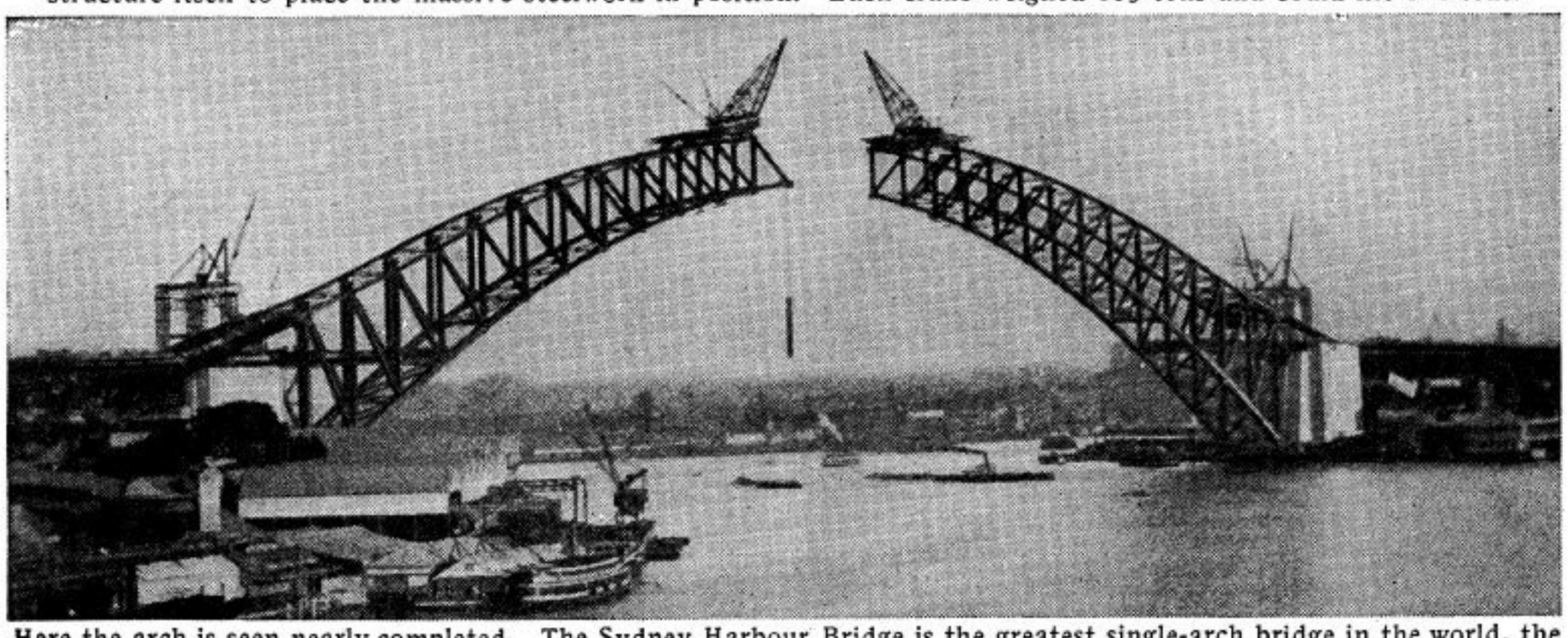
THE GREAT BRIDGE ACROSS SYDNEY HARBOUR



Here is the Sydney Harbour Bridge in Australia. Its great steel arch has a span of 1650 feet and is 160 feet wide. Its track, 170 feet above high-water, has accommodation for four lines of electric railway, a roadway with space for six lines of traffic, and two footpaths each 10 feet wide. The bridge was built by a British firm and cost £9,000,000.



This picture shows how the arch grew simultaneously from both sides of the harbour, with great cranes mounted on the structure itself to place the massive steelwork in position. Each crane weighed 605 tons and could lift 122 tons.



Here the arch is seen nearly completed. The Sydney Harbour Bridge is the greatest single-arch bridge in the world, the arch itself containing 37,000 tons of steel, though New York's Bayonne Bridge is slightly longer It was opened in 1932.

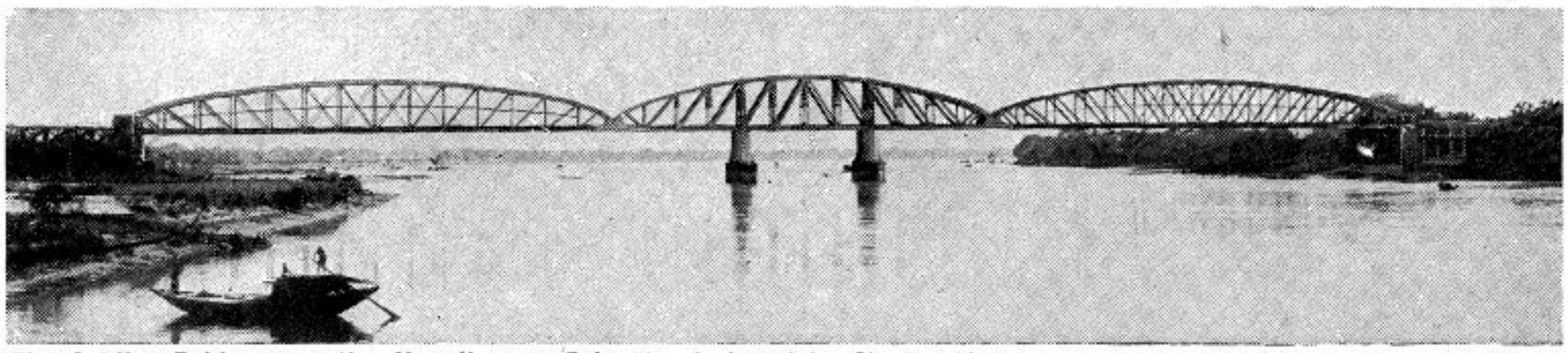
THREE OF AMERICA'S WONDERFUL BRIDGES

Like the Sydney Harbour Bridge the Bayonne Bridge which spans the Kill van Kull, an important New York waterway, depends for its main support on an enormous steel arch. It is the longest steel arch in the world, having a span of 1675 feet.

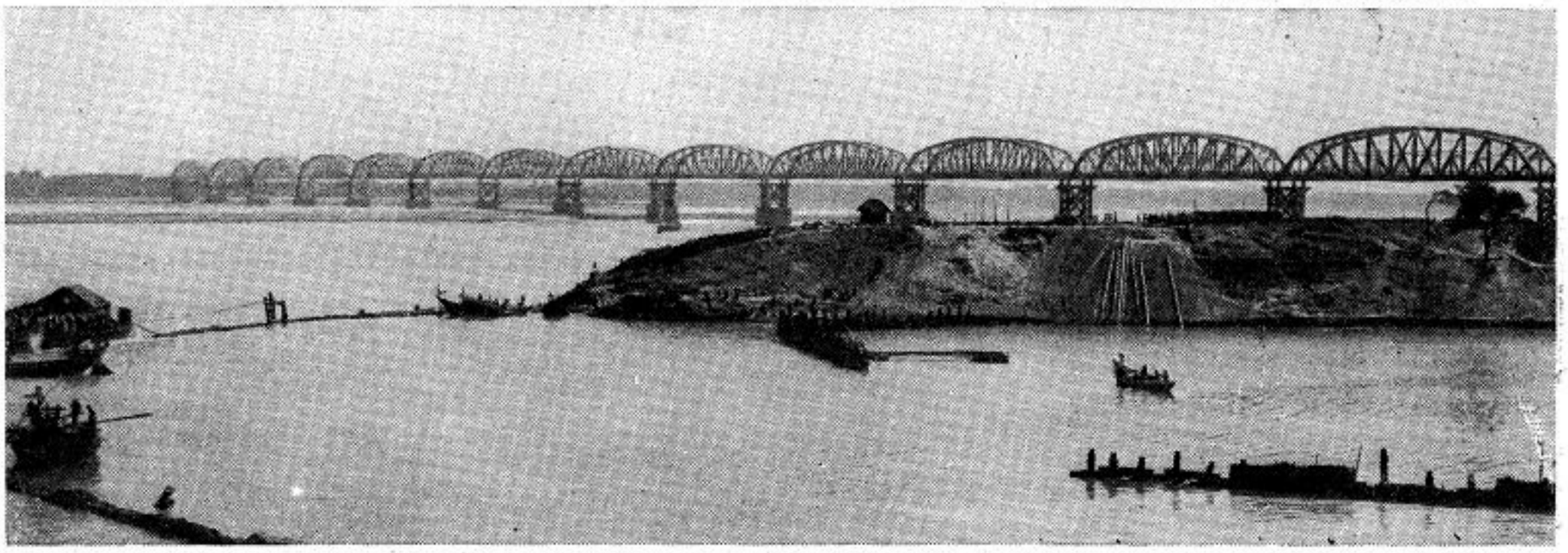
Here is another of New York's great bridges, the George Washington. It is a suspension bridge which crosses the Hudson River with a span of 3500 feet between the towers.

The Delaware River Bridge, which connects the cities of Philadelphia and Camden, has a splendid roadway for six lines of traffic. It bridges a channel 1750 feet wide.

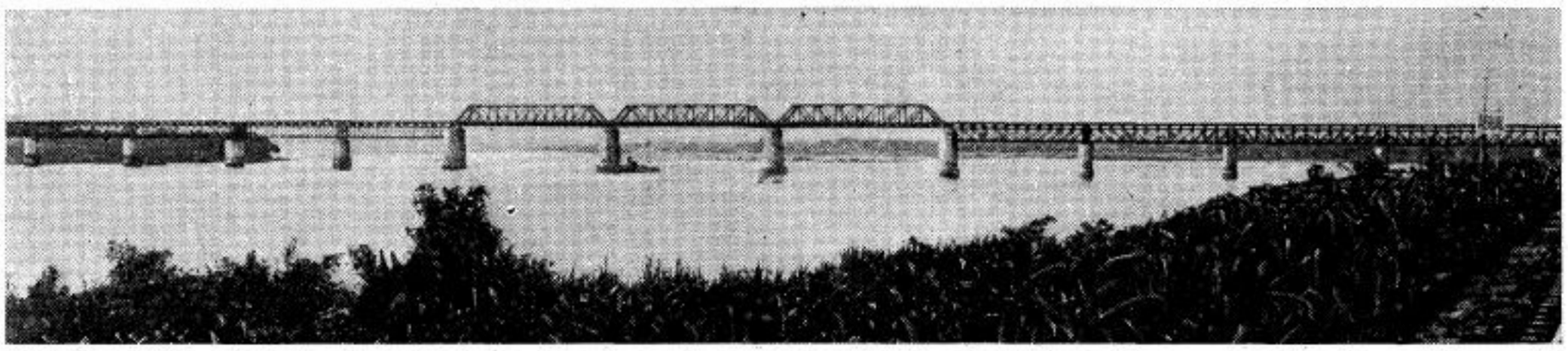
FIVE FINE BRIDGES IN FOUR CONTINENTS



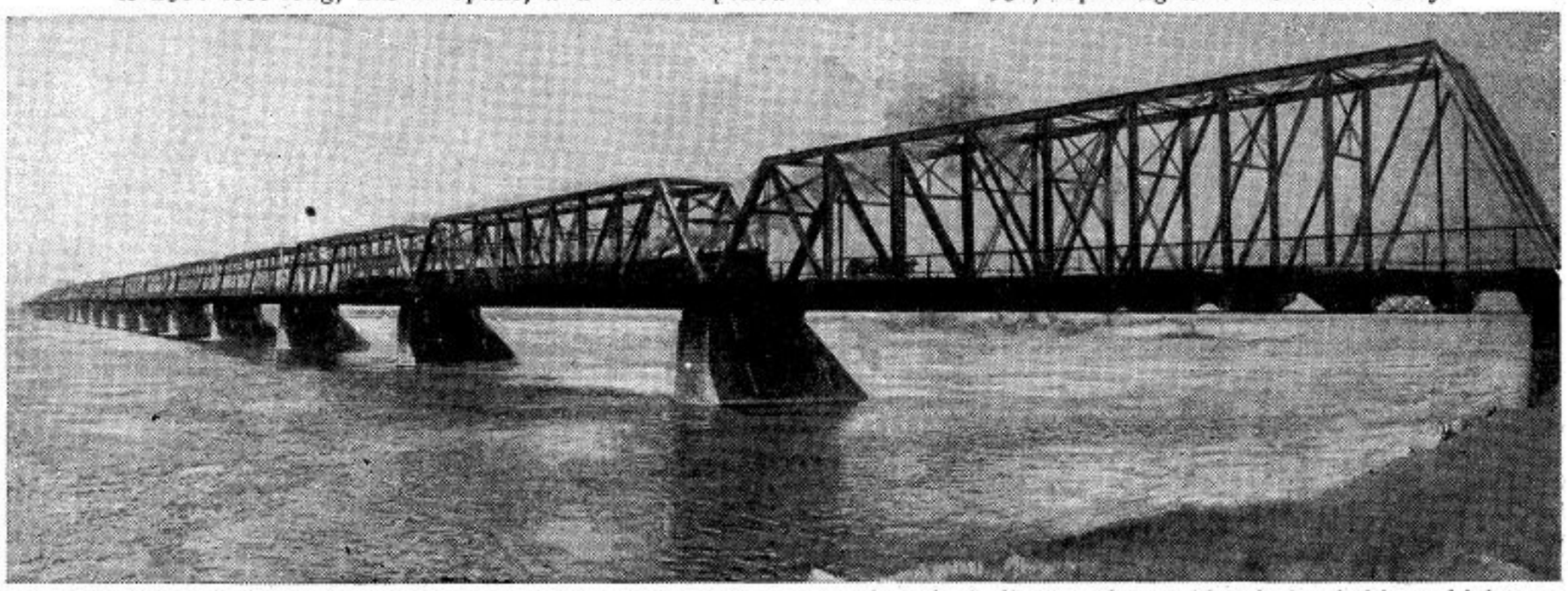
The Jubilee Bridge over the Hoogli, near Calcutta, designed by Sir Bradford Leslie, is another fine example of railway bridges. The central double cantilever is 360 feet long and the two side span girders are 420 feet long.



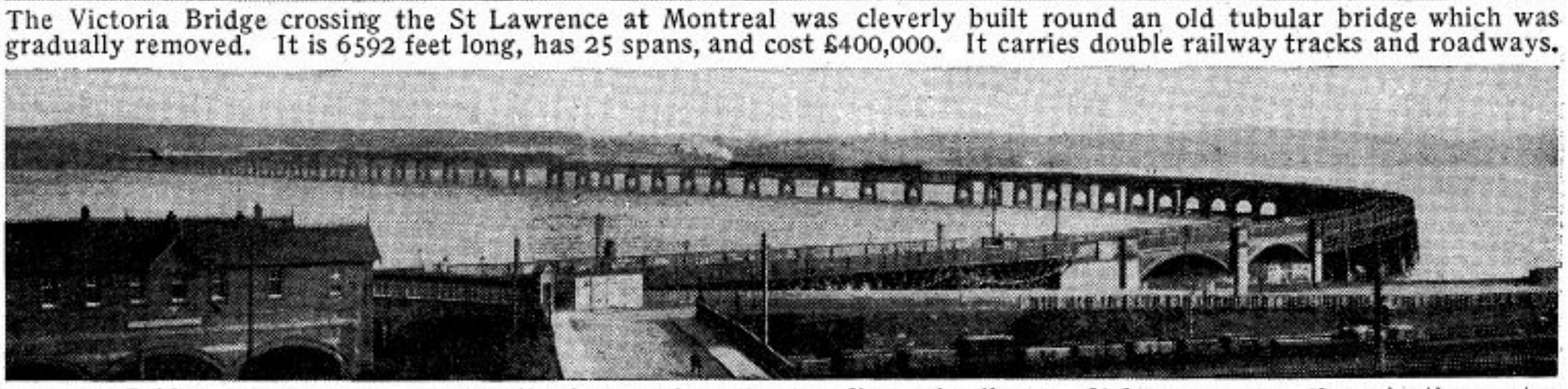
The Hardinge Bridge which crosses the Ganges about 120 miles from Calcutta carries a double line of railway and has a footway five feet wide. It has fifteen river spans of 345 feet each and three smaller land spans.



This fine bridge at Makurdi in Northern Nigeria carries a roadway and a single-line railway across the Benue River. It is 2584 feet long, has 22 spans, and it was opened for traffic in 1932, replacing a former train ferry.

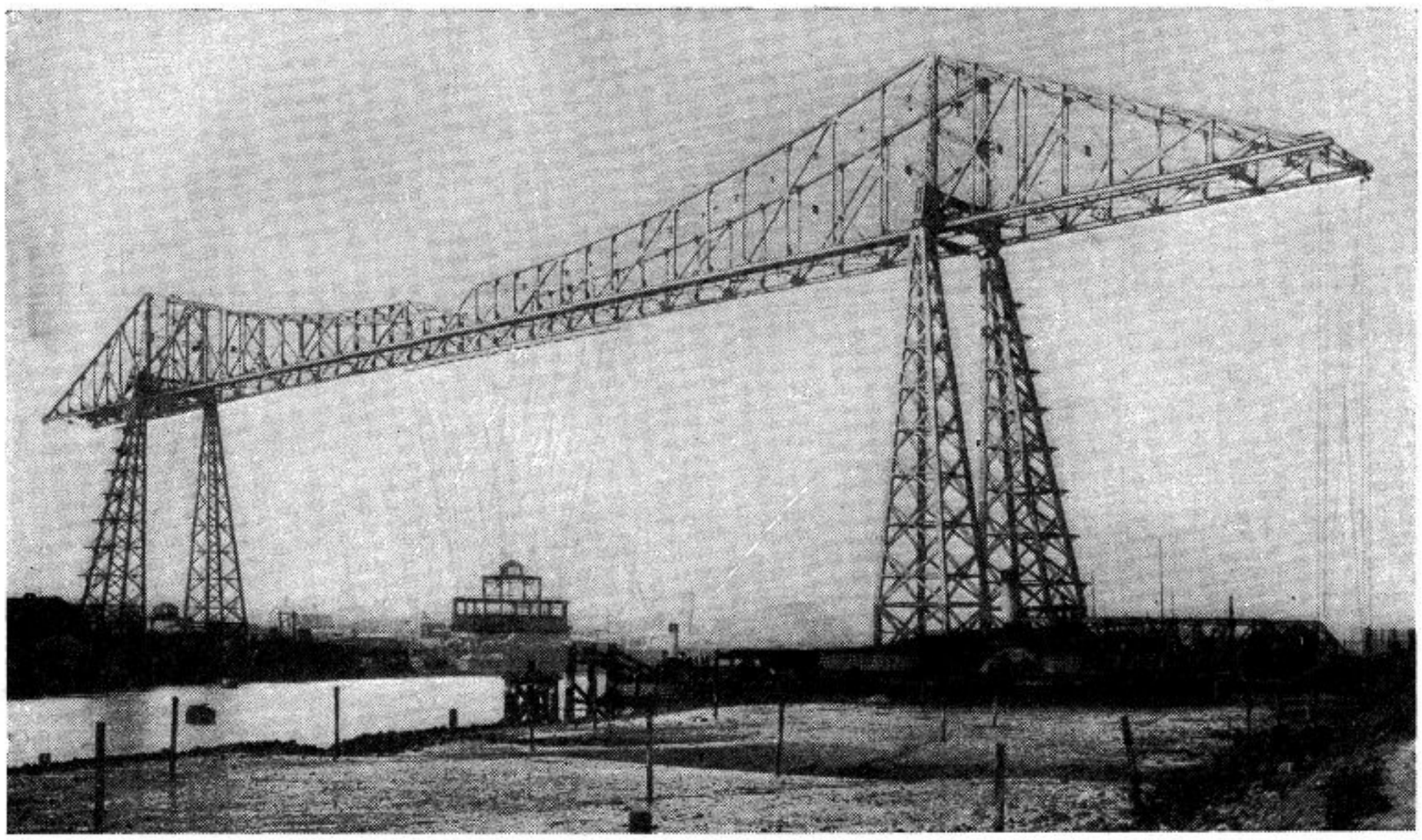


The Victoria Bridge crossing the St Lawrence at Montreal was cleverly built round an old tubular bridge which was gradually removed. It is 6592 feet long, has 25 spans, and cost £400,000. It carries double railway tracks and roadways.



The Tay Bridge, near Dundee, is two miles long and carries two lines of railway. It has 74 spans, those in the centre allowing a clear 79 feet for the passage of ships. Finished in 1887, it cost £670,000. The first Tay bridge collapsed.

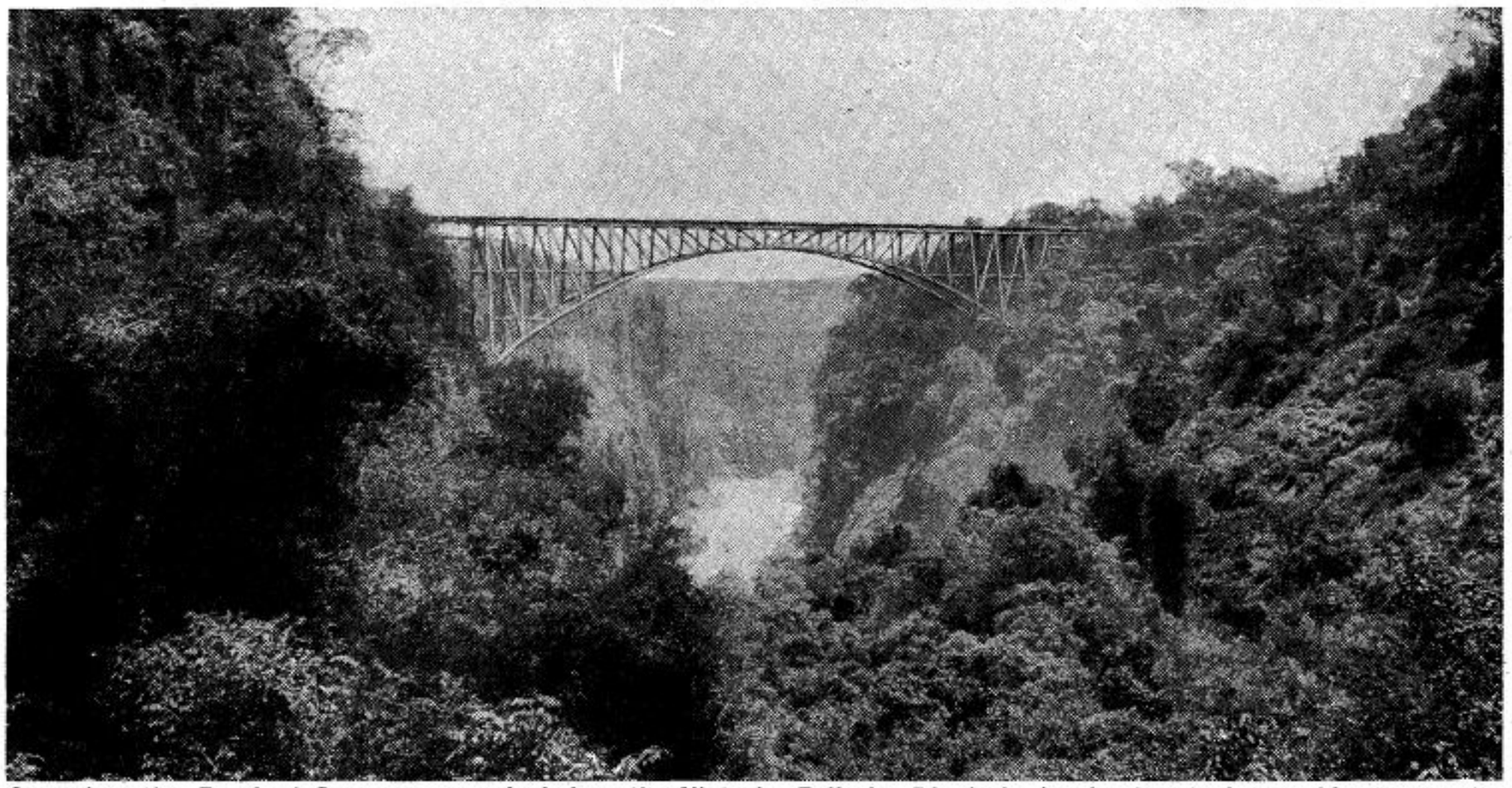
THE TRANSPORTER AND THE LIFT BRIDGE



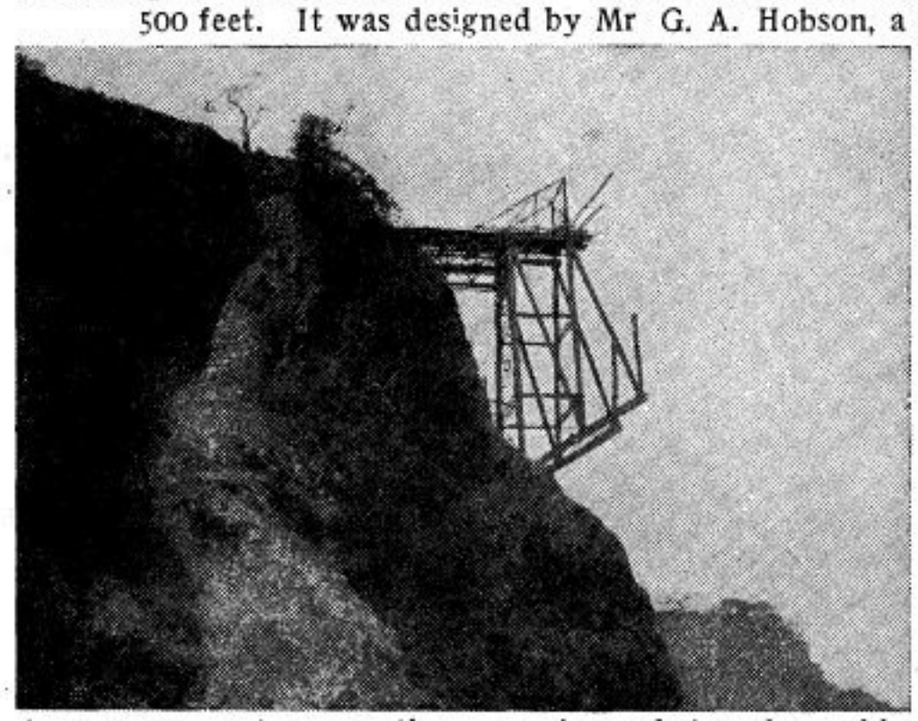
On transporter bridges foot-passengers and vehicles are carried across in an enclosed car suspended by steel wire ropes from a trolley running on rails on the under-side of the bridge and worked electrically. A car may carry about six vehicles and 300 passengers at each trip. The picture shows a transporter at Middlesbrough.

Sometimes when a bridge is needed to cross a busy waterway a lift bridge is built. The roadway of this wonderful example at Middlesbrough is shown in its raised position where it allows a clearance of 120 feet above water-level for shipping to pass on the Tees. It has a span of 270 feet and is said to be the biggest vertical lift bridge in the world.

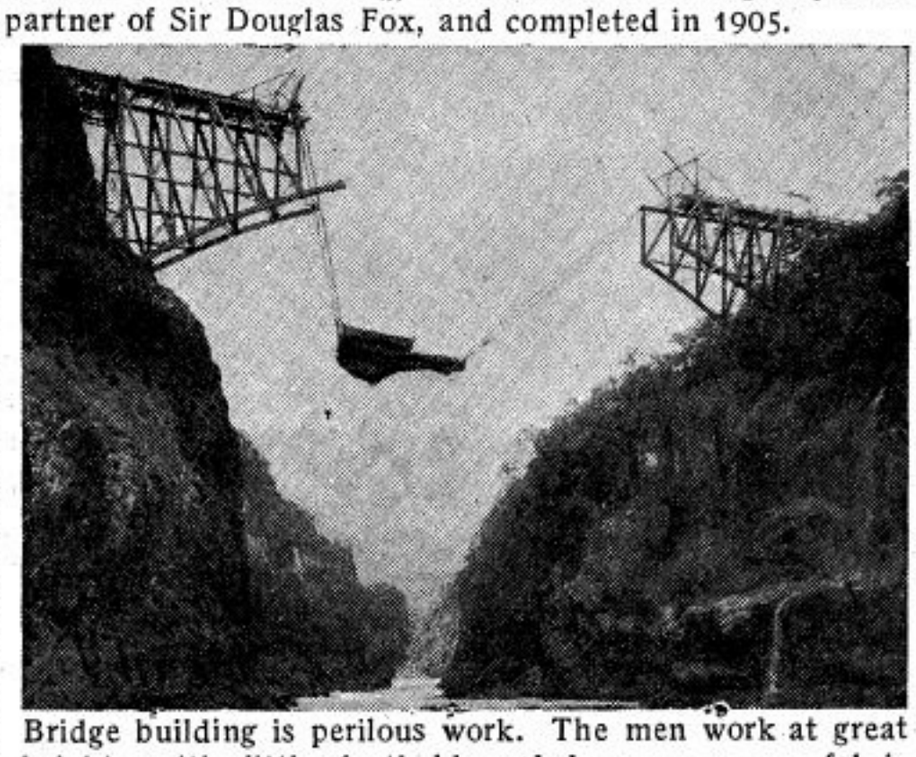
BUILDING AFRICA'S HIGHEST BRIDGE



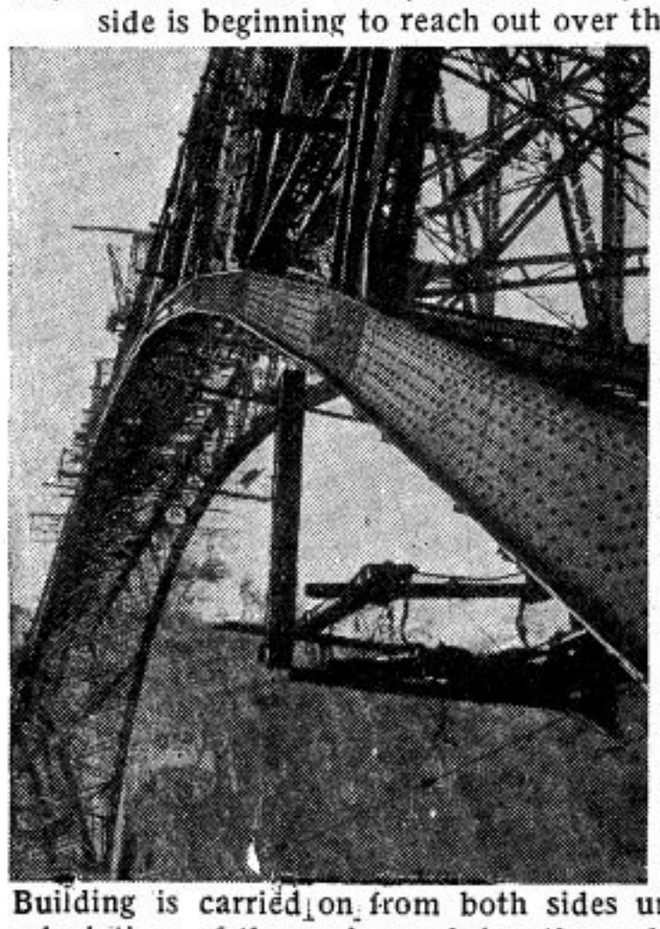
Spanning the Zambesi Gorge, 400 yards below the Victoria Falls in Rhodesia, in the heart of magnificent country is the highest bridge in all Africa. It is 420 feet above the water and 650 feet long, the centre arch having a span of 500 feet. It was designed by Mr G. A. Hobson, a partner of Sir Douglas Fox, and completed in 1905.



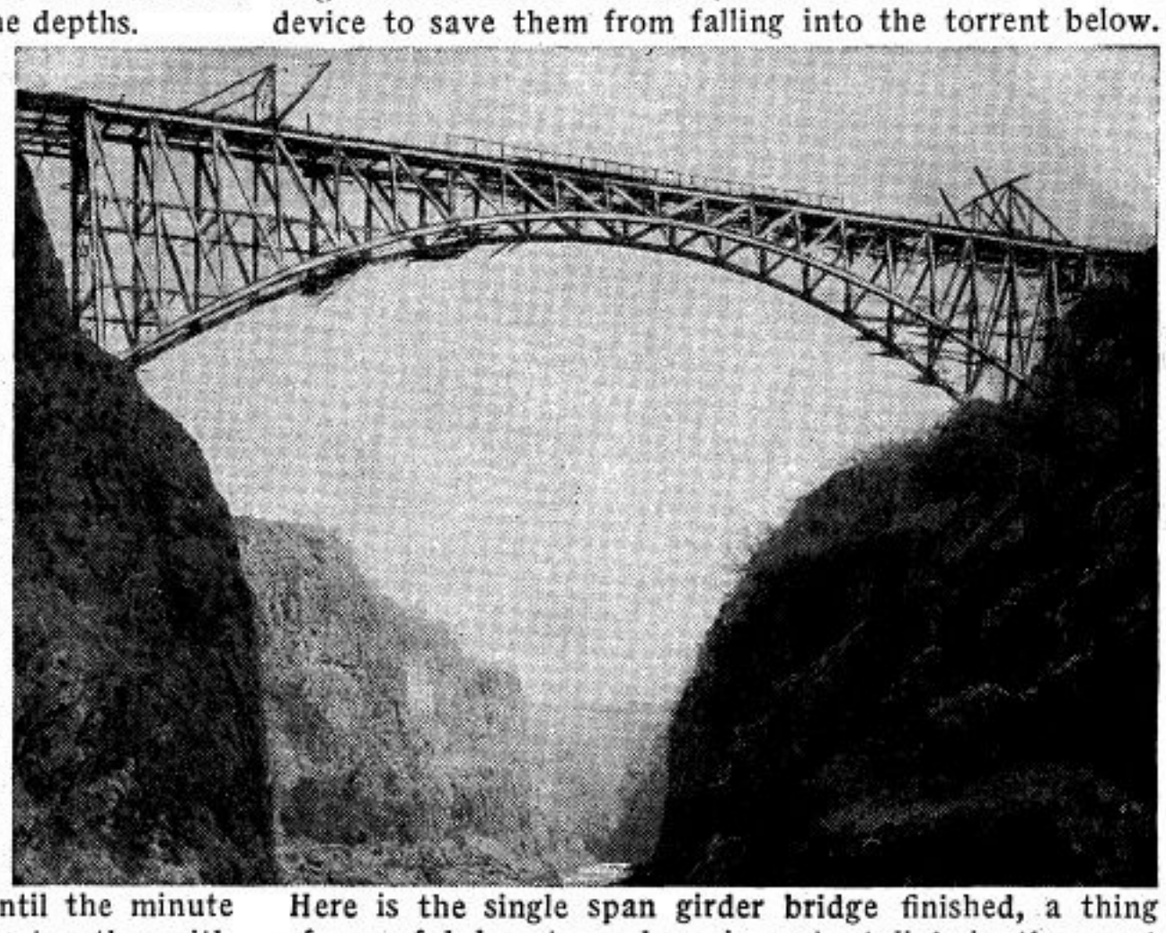
A rope was sent across the gorge by rocket and a cable was hauled across. Then work was begun, and here one side is beginning to reach out over the depths.



Bridge building is perilous work. The men work at great heights with little foothold, and here we see a fabric device to save them from falling into the torrent below.



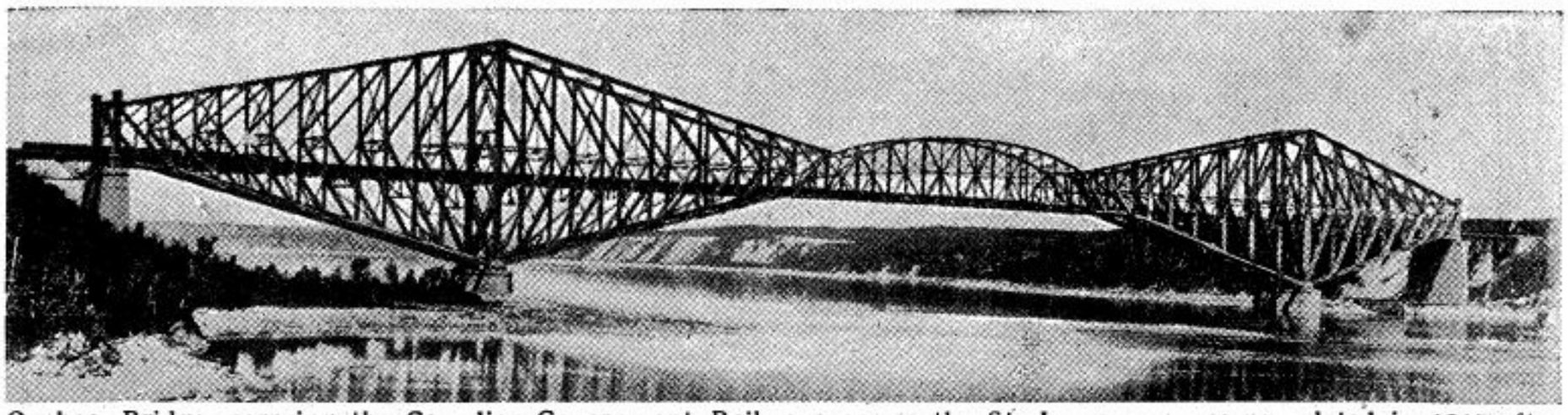
Building is carried on from both sides until the minute calculations of the engineers bring the ends together with beautiful exactness. Looking upward we see that the chasm has been successfully spanned.



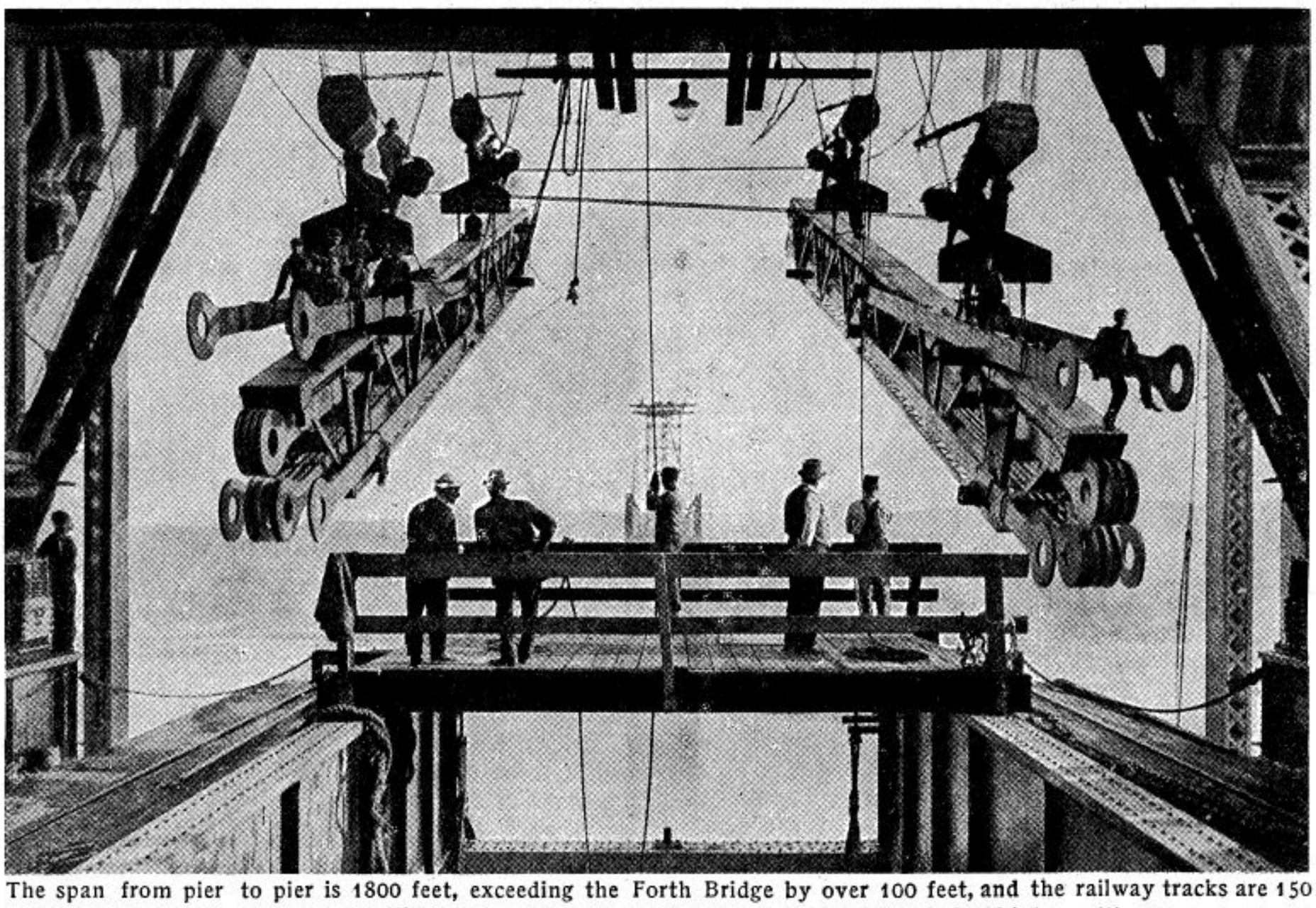
Here is the single span girder bridge finished, a thing of graceful beauty and an important link in the great railway, the dream of Cecil Rhodes, that some day will run from the Cape to Cairo.

The photographs on this page are by courtesy of the High Commissioner for the Union of South Africa

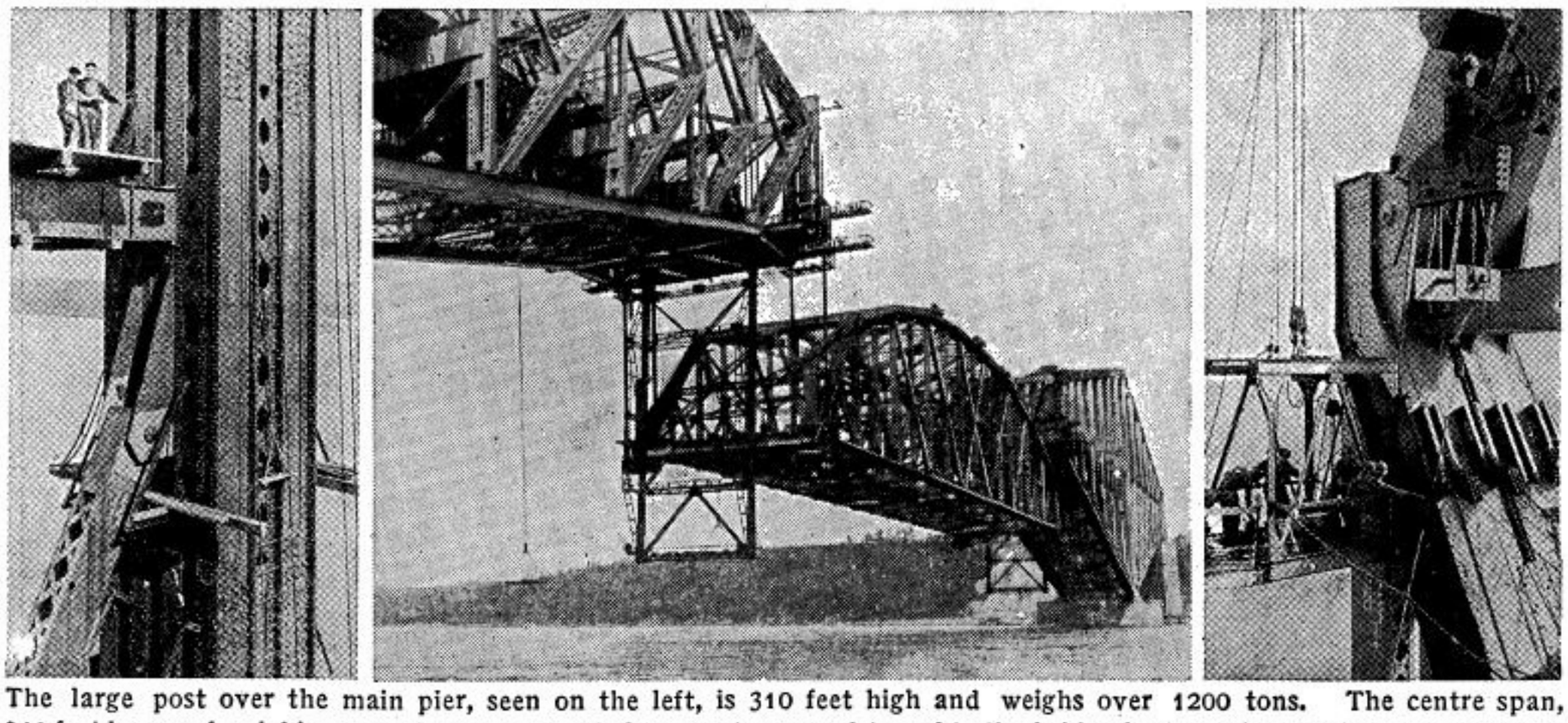
A BRIDGE THAT BROKE DOWN TWICE



Quebec Bridge, carrying the Canadian Government Railways across the St. Lawrence, was completed in 1917 after much trouble. In 1907 half the bridge collapsed under its own weight; in 1916 the great central span, when being hoisted into position, fell into the river. 66,480 tons of steel and 8,000,000 rivets were used in the bridge, which cost £4,000,000.



The span from pier to pier is 1800 feet, exceeding the Forth Bridge by over 100 feet, and the railway tracks are 150 feet above water. This picture shows the upper chord eyebars being hoisted into position.



The large post over the main pier, seen on the left, is 310 feet high and weighs over 1200 tons. The centre span, 640 feet long and weighing 5000 tons, was erected on pontoons and towed to the bridge by tugs; it took four days to raise it into position. On the right, workmen are connecting the first panel of the cantilever arms.

Plain Answers to the Questions of the Children of the World

DOES LIGHT DIE AWAY?

THE light of a star will disappear if the star grows cold and "goes out." Any star we see tonight may already have gone out, for the light we see it by left it long ago. Though light may be so steady and seem so permanent, yet we must think of it as we do of an electric current. Light really is a sort of electric current. It has to be made and kept up from moment to moment. To make light a star must *spend power*, and if the new power is not forthcoming the light will cease, just as an electric current will cease if the battery runs down. So that light dies away if you do not continue to make it.

It is true, of course, that light often appears to our eyes to die away, but that is merely because our eyes are not strong enough to follow it beyond a certain distance, especially if the light is not very bright.

We can see lightning for very many miles; probably only the roundness of the Earth prevents us from seeing it still farther than we do, for, of course, the time comes when the light, as it flashes through the air, will be cut off from the eyes of people far away, because they are, so to say, "round the corner" of the Earth. In questions like this we must remember that light can travel any distance, and will, indeed, travel infinite distances so long as nothing stops it. Therefore, if the light remains bright enough for our eyes to be affected by it, we can see to the distance of the thing which is giving out the light. Thus, when we see a star, we see to a distance of billions of miles.

We know that the farther off a bright thing is, the less bright it seems. We know that the Moon, or a planet like Venus, is brighter than the stars to our eyes, though not a ten-thousandth part so bright in reality, because it is near. Yet light will travel on for ever unless it is stopped. So far as we can judge, light as it travels suffers no loss at all; none of it is absorbed or lost.

Yet we know that somehow light gets fainter as it travels. The reason is that the light spreads in all directions as it travels, and so gets less intense at any particular place—as, for instance, where it strikes the curtain, or retina, of our eyes. The law governing this phenomenon is known exactly. If the distance is doubled, the light is one-fourth as bright; if trebled, one-ninth as bright; if quadrupled, one-sixteenth as bright. To get the intensity, we must take the square of the distance—that is, multiply it by itself—and then the intensity is so much less. We say that it varies *inversely* as the square of the distance. In other words, when a light is moved two yards away from us it seems four times less bright to us; if it is moved ten yards it seems a hundred yards less bright to us.

How Much Water is There in the Sea ?

Most of us know that much more than half the whole surface of the Earth is covered with water, and if the Earth had been of a slightly different size from the size it is, the whole of its surface would be one great ocean. A recent estimate of the extent of the ocean's surface may be trusted as a very careful and precise one.

It is rather higher than others we have heard, and now we may take it that *five-sevenths* of the Earth's surface is covered with water. If now we could learn the average depth of the sea all over the world, it would only need a big multiplication sum to answer this question.

We find great variations in the depth of the oceans—places where the highest mountain might be buried, and great shallow areas, too ; but the latest result of an enormous number of soundings taken in every part of the sea, except at and round the Poles, is that the average depth of the oceans all the world over is a little under two and a half miles. This is probably a great deal deeper than you would have thought, and it means a rather long sum if you want to learn the number of *cubic miles*. As a matter of fact the scientists who went on the Challenger expedition estimated the amount of water in the sea at 323,722,000 cubic miles.

Why Does Blotting-Paper Absorb Ink ?

It is mainly a question of the surface of the paper. A very hard, very smoothly glazed paper will scarcely absorb any ink. If we write on such a paper, the ink takes a long time to dry ; and what makes the writing is simply a layer of the solid matter left by the ink that lies on the outside of the paper.

All other papers absorb ink to some extent. Ordinary paper, such as these words are printed on, absorbs a good deal. The drying of the ink means that the water of it has evaporated into the air, while the solids that were dissolved in it remain in or on the paper. But a paper of loose texture, with a rough, unfinished surface like blotting-paper, absorbs ink just as a sponge sucks up water ; and the water of the ink, instead of mainly remaining on the outside of the paper until it dries, runs into the substance of the paper, according to the amount of ink we use. That is why the letters are blurred when we write on blotting-paper.

Can We Think Without Words ?

There are some kinds of what is really thinking, where the things which are put together or related are not words, but something else. Some men, for instance, in doing what is called algebra, can think without using words at all. They can find out, for instance, what this means : A + B × A − B. Somebody has actually written to Mr. Mee asking him to have the Children's Encyclopedia written in figures as well as in words ! Or, instead of thinking in words or figures, men can think in lines and angles and curves, and find out all sorts of wonderful things in this way.

Euclid could think in this way about as well as anyone who ever lived. Other men can think in sounds. One of the greatest musicians who ever lived, Beethoven, wrote some of the most marvellous music in the world, which will be listened to as long as men have ears, long after he had become stone-deaf. He put the ideas of the sounds together in his head. He could think in notes as easily as you and I can think in words.

Is Iron Heavier When It Rusts ?

We have to find out what happens when iron rusts, and then we shall have the answer to this question. What happens is that the outside of the iron which is exposed to the air is burnt, or oxidised A certain amount of the oxygen of the air is added to the iron, therefore. This oxygen, like everything else, has weight, and its weight must be added to the weight of the iron itself when the iron is rusty. Therefore, the answer to the question must be yes. The iron increases in weight by the weight of the oxygen which it has added to itself. But the rust, or *oxide of iron*, is friable, a Latin word which means crumble-able.

The rust will crumble away under the influence of water or wind or anything else rubbing against the iron, and so the iron thing will lose not only the oxygen that it has taken into itself, but also the part of the iron which has combined with the oxygen. So an iron thing, when it rusts, loses weight, and that is very serious, of course, for it means that the thing loses its strength. And if an iron or steel bridge were allowed to crumble away in this fashion, it would soon break. That is one reason why we must keep such a bridge thoroughly painted.

Is the Country Healthier Than the Town?

The country is healthier than the town for two reasons. They are that the country gives us purer air to breathe, and more sunshine, as the country air is clearer and does not stop so much of it as town air does. On the other hand, the towns are usually much better off than the country in the matter of drains and of water. Further, if people are wise and reasonable, it is better for their health of mind to see people, and to be not too much forced in upon themselves. In this way, the town is better than the country; and it is a fact that there is more insanity in the country than in towns. It is foolish to abuse cities blindly, as many people do. There never has been a civilisation without cities. Athens, and Rome, and Jerusalem, to which we today owe almost everything, were cities.

The time will come when people will see this, and will try to make their cities as healthy as the country in air and sunshine. They will not allow smoke to make the air impure, and so they will get better air into their lungs and more sunshine; they will build all houses with gardens; they will stop the unnecessary noises of cities; and so will make places where men can meet, and hear each other speak, and discuss things, while still keeping the advantages of the country.

Is there a Colour our Eyes Cannot See?

It is our brains that translate into colour something outside them which we call waves of light. If there were no brains, those rays of light would still exist, but, plainly, it would not be proper to say that there were colours.

Now, what happens in the case of light is that, if we compare all the possible kinds of light to the notes on a piano, there is just about one octave in that large compass that our eyes can see. The notes above and below that octave are there though we cannot see them.

If our eyes could see them, they would certainly be of different colours from the light that we can see. The notes below the red end of the octave that we can see would appear as some other colour which, of course, we cannot imagine; and the notes above the violet end of the octave we can see would appear as another colour. It has been clearly proved that some insects, such as ants, can see these rays of light beyond the violet to which our eyes are blind. But what colour it looks like to them, of course, no human being can ever tell. It is very interesting to know, however, that there are animals which can see notes of light which we cannot see, just as there are animals which can hear notes of sound too shrill for us to hear.

What Does "Safety First" Mean?

Safety First is a motto that has been very much used in recent years, and is a tribute to the growing appreciation of the value of human life. It originated as an industrial term, and was used in connection with factory life as a short and convenient way of enjoining on both employers and workpeople the importance of taking every precaution against accident.

A Safety First Council was formed, and gradually the scope of the movement was extended to cover other spheres, as, for example, the crossing of roads, the entering and leaving of public vehicles, and so on. Notices are posted in motor-buses and tramcars by the Safety First Council urging people to take care of passing traffic when getting in and out.

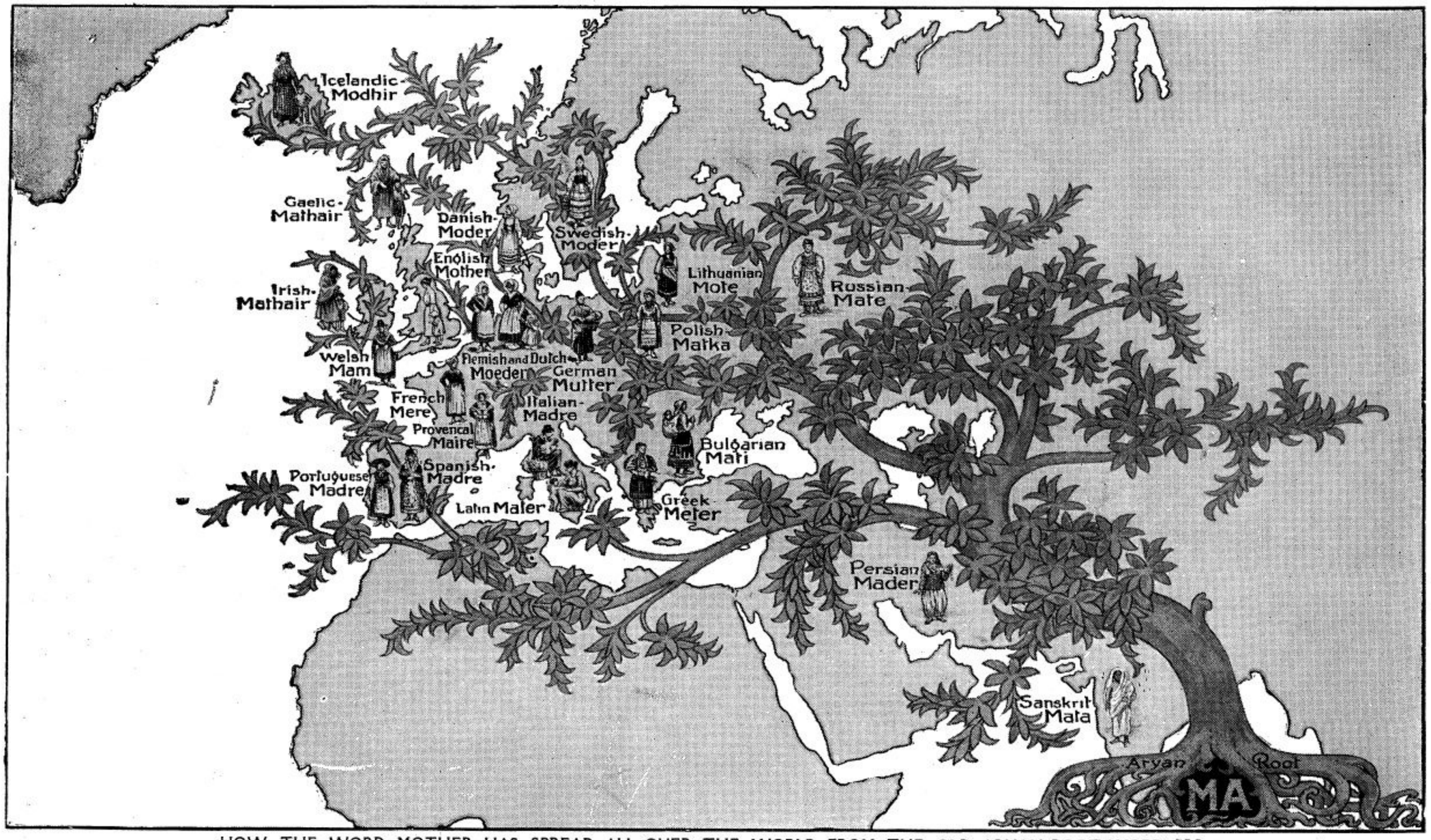
The term rapidly became so familiar that its use was still further extended, as when a distinguished admiral, speaking of the importance of the British Navy being adequate in size and equipment, summed up the need in the words of the motto "Safety First."

What Does a Bird Sing About?

Whenever a child or a bird or anyone else sings naturally, it sings about its feelings. If you have no feelings you ought not to sing. Sometimes we sing just to show that we are cleverer than other people, and when we do that we do not feel what we are singing, and everyone is glad when we stop. But the birds only sing when they must—when their feelings find their way out somehow. Then they try to tell the world how happy they are. The feelings that birds sing about are always happy feelings. When a bird is ill, or miserable, or unhappy, it never sings. It only sings when it is well.

Generally, birds sing to express their feelings of love, and to call to their mates and their friends when they want company. At other times they sing simply for the joy of living, as the lark sings.

HOW THE LOVELIEST WORD IN THE WORLD HAS SPREAD OVER THE EARTH LIKE A TREE



HOW THE WORD MOTHER HAS SPREAD ALL OVER THE WORLD FROM THE OLD ARYAN ROOT-WORD **MA**

What Makes the White Marks on Our Nails?

Our nails are made of a very special kind of horny material. It is in some ways like the material that makes the outer skin; it is also still more like part of the material that makes the hair; but it is different from either of these, and comes closer to horn than any other part of our body does. It is made by special cells of the deeper part of the skin at the base of the nail, and the health of our nails, therefore, depends entirely upon the perfect health of these wonderful cells.

In cases where a person's skin is not healthy it is very commonly found that the nails suffer, dropping out or becoming cracked or brittle; and if for any reason the blood is out of order, and so supplies what is not quite suitable, or may even be poisonous, to the cells at the base of the nail, their work will be interfered with, and though they may go on producing nail stuff, it will not be quite what it ought to be.

In this way we can often see white marks across the nails, sometimes on all the fingers of both hands, corresponding to the date when we were out of health, and when the proper nail substance could not be made. The toe-nails may also show indications of these white marks, as we should expect.

Are There Families in Words?

Words and languages are grouped in families in exactly the same way as the peoples who speak the languages. Philologists, the men who study words and compare the words in different languages that stand for the same things, find words closely resembling one another, and come to the conclusion that they must be related, especially when other groups of words in the same languages show similar resemblances.

A good example is the word for Mother, which is very similar in many of the languages of the great and important group known as Indo-European, including Sanskrit, the ancient religion of India, Latin and Greek, and the modern languages of Europe.

Though these mother-words are very much alike, it is clear that one did not come from another. Our word mother, for instance, is not derived from the Latin mater, although it closely resembles it. The resemblances of the various words for mother are too great to be accidental, and so men of science conclude that they are sisters and cousins, all derived from one mother language, the so-called Indo-European tongue.

Exactly where that was spoken we do not know. Some have thought the home of the Aryan people, who spoke it, and from whom the nations referred to are descended, was in Asia, but no one can say definitely.

Philologists, however, by comparing the many mother-words, trace these all back to a common root, the old Aryan root Ma, which must have existed at some time, or all these words for mother in the many Indo-European languages could never have grown up so like one another as they are today.

Why are the Words "Ancient Lights" Put Outside Windows?

When we see these words placed on the outside of a building we know that the owner of the property is warning other people not to build in such a way as to keep out the light from the windows or openings over which he puts his notice.

The law is that if for twenty years we have the light admitted by a window or opening into our premises, without interference from anybody, then we have the right to continue to be supplied with light in exactly the same place. Suppose a builder buys the land in front of ours, he might build a great place which would overshadow ours and block out the light. The law says that he shall not do that. Provided that we have had the privilege of light for twenty years, no man may build us up if we object, and our notice-board warns him that we do object.

In order to guard against having to pay for such a privilege, builders will sometimes, before the necessary twenty years have passed, deliberately darken other people's windows.

There was once a wretch who put up a huge black hoarding as high as the top of some cottages, entirely blocking up the view from the front of those houses, in order that they might not have twenty years of light, thus hoping to prevent the landlord from claiming compensation for ancient lights when the time came for new houses to be put up on land adjoining. He did not think of the misery he was causing the poor people who lived in these cottages.

Why Does the Chameleon Change its Colour?

The object of the change of colour of the skin of the chameleon is to enable it to become like its surroundings at the time, and so aid it in concealing itself.

This capacity the chameleon shares with many other lizards, and they are able to change because they possess within the skin a great number of small cells closely packed together, filled with small granules. This causes a white colour by reflecting light. Other cells are full of oil drops and appear yellow; others contain brown or reddish pigment, and the changes in colour are brought about by contraction of different parts of the skin, and the movement of the different pigments.

Thus, when all the pigment is forced toward the surface the animal looks quite dark. When the pigment is not so near the surface the colour is changed to green, and where there is no pigment the skin appears yellow. The mechanism which causes these changes appears to be under the control of the will of the chameleon, but, in addition, the external surroundings, such as heat or cold, also cause some changes in the colour.

What Makes a Dimple?

In order to understand a dimple, we should know the structure of the skin and what lies underneath it. In most parts of the body the skin, with its outer horny layer, and the inner living layer, which carries nerves and blood-vessels and makes the horny layer afresh from day to day, lies very loosely upon the layer of tissue beneath it. This is a loose layer, containing a certain number of fibres running in all directions, with fat-cells lying between them in healthy people—except under the skin of the eyelids, where fat is never found even in the fattest people. A few of these fibres are attached to the under surface of the skin, so that, though we can move the skin about very freely over what lies beneath it, there is a limit to this movement.

But where there are dimples, as on the face, and often round such joints as the knee and the elbow, the number of fibres attached to the under surface of the skin is much increased, and they are rather short, so that the skin is depressed, or dimpled, at these points. We see what is really the same thing produced accidentally in the case of many scars, which are often a little depressed below the general level of the skin because they are tacked down in the same way. But a scar differs from a dimple, as the skin over a scar has been lost, and is replaced by a new thing called scar-tissue, whilst the skin over a dimple is true skin.

Is it Darkest just Before Dawn?

There is probably very little ground for this belief. At any rate, we may be quite certain that in all cases like this, where we compare darkness and lightness, or loudness and softness, it does not do to trust to the evidence of our senses, because they do not judge fairly.

There are various ways by which we can measure the brightness of light. In order to prove that it was darkest just before dawn it would be necessary to use some kind of light measurer—not our eyes—and compare the amount of light it recorded just before dawn with what it recorded previously. Our eyes and senses in general do not judge things on their own merits, but always by comparison with other things.

The proper way to say this is that all our sensations are relative. A room may be light relatively to a room that is less light. If we go to the room from darkness we call it bright; if we go to the room from blazing sunlight we call it dark. And so we judge the darkness before dawn by the dawn. When daylight begins to come, we think how dark it was before.

Why is Salt Damp When it is Going to Rain?

When we say that the salt is damp, we mean that it has taken a lot of water into itself, and of course it has absorbed the water from the air. Common salt, like a host of other things, will help itself to the water in the air, though many other salts will do so far more readily than common salt does. We are speaking, of course, of water that was in the form of gas, making up one of the gases in the air.

Plainly, the reason why salt becomes damp before it rains is that before it rains there is an unusual amount of water-vapour in the air. Indeed, the rain is due to the fact that the water-vapour in the air has become too great in amount for the air to hold it any longer, and so down it tumbles in the form of rain. When raindrops form, we know that the water-vapour of the air condenses in little drops around particles of dust, and so on, in the air. Similarly the water-vapour in the air condenses upon the particles of salt.

St. Francis and St. John with the Madonna, by Pietro Lorenzetti—On the church walls of Assisi

THE WONDER MEN OF FLORENCE

THERE is a little town in Tuscany called Siena, a tranquil if a dirty place, sitting in the sun. Lovers of beautiful things have a warm feeling for Siena; here in the thirteenth century were shown the first tender manifestations of that spiritual force called the Renaissance, the awakening of art after its long sleep.

The Renaissance in art was due to the workings of the Gothic movement north of the Alps. A very great beauty sense lay behind this movement, as mysterious as beauty always is. It was something intensely airy and alive, with wild-flying wings; and very different from the heavy brooding of the Romanesque movement.

This lightness, this airiness, captured men's hearts and found its expression not only in buildings which flung up their lines like wheeling birds, but in statuary and coloured shapes. From Southern France the joy in lovely forms and natural beauty spread like a heavenly contagion. It touched the heart of Duccio di Buoninsegna, the Sienese, who became the first great Italian painter; and it presently touched the hearts of his fellow townsmen to such an extent that when he had finished his great altar picture they turned out in a body and carried it triumphantly to the cathedral. Bells rang from the steeples; the town had a holiday in honour of the beautiful thing.

This event, not the only one of its kind in the history of Italian art, throws a light on the peculiar workings of the Renaissance. For several hundred years ordinary citizens cared intensely about art. We can realise into what a far country we have travelled, how great is the gulf separating our cold selves from those ardent medieval people, when we try to imagine any community today making a triumphal procession for no other reason than that someone had painted a picture.

Duccio lived from about 1255 to 1340. Although he was a child of the Gothic period, his painting was a strange mixture of the new sense of beauty and the lifeless Byzantine grandeur which hung about Christian art in Italy like a gorgeous, stifling pall. Duccio tried to begin to understand and express what a living line meant. Byzantine lines were all dead. The Sienese artist must have known that a living figure has a certain vibration; he almost found it; he was obviously groping for it all his life, and in doing so he founded a style in which a delicate pale emotion, a struggling for vitality, are evident. Duccio's followers founded a school within a school; the Sienese within the Tuscan.

We are coming to a period in the story of art when men's names and dates crowd thick on the pages, and, as there is nothing quite so meaningless as a long string of words in an unfamiliar tongue, we will look at the painters in groups. If we can learn the characteristics of the various schools, we shall have gained enough knowledge to walk into the National Gallery or turn over a book on art, and say, without looking at the name of a picture, "that must be Sienese"; "that is Florentine, and that Venetian."

THE STRANGE COUNTRY IN THE ROOMS OF THE NATIONAL GALLERY

The great men of the periods we shall unconsciously learn in learning the schools; then we shall be in the happy position of knowing the language of a strange country.

For, there is no doubt about it, the National Gallery, or any other gallery owning a collection of *primitives*, is, on the first dozen visits or so, a strange country to most of us. To thousands of people it is never anything else. They go there as a duty; it is one of the shows of London. They have been told by enthusiastic people that the National Gallery contains certain beautiful pictures, but they themselves find them simply ugly; they walk away, and in future avoid the gallery. Thus one of the richest treasures of our national inheritance becomes meaningless and void.

This is partly because our eyes are untrained and partly because beauty is a relative term. All artists strive for the expression of the beautiful, and some succeed better than others. Each man's work is important in itself as an expression of his individual sense of beauty, and also important in the part it plays in the world-movement of all the arts *toward the expression of absolute beauty*.

WHAT WE MUST REMEMBER IN STUDYING PICTURES

The paintings of the Sienese have more of a historic than an individual sense of beauty. The painters were ignorant of technique, perspective, often of ordinary drawing. They worked in water-colour on linen stretched on wood, the fabric having been first dressed with glue. They used a great deal of gold, laying it on the canvas in leaf, and afterwards burnishing it, according to the dying-out Byzantine tradition. Their art was elementary, and they were truly called Primitives. But it marks the first step away from the real Byzantine, and that, in the history of art, was a step toward the realisation of ultimate beauty.

In trying to understand pictures which, according to the judgment of history, are great, we have to take into account more than drawing and colour and subject. A point of great importance in the study of the early Italians is the period of the various artists. For this reason we should always look at a Renaissance picture from the standpoint of the painter himself, and forget that we are the curious onlookers of a far later day.

For instance, painters of early Italian religious pictures were used to seeing, every time they went to church, wall-paintings or mosaics of Biblical subjects. These decorations had been made by order of the Church, certain subjects to fill certain panels, the type of person in the picture settled once and for all, it seemed, by the council of Nicaea.

THE NEW JOY PREACHED BY SAINT FRANCIS WHO LOVED THE BIRDS

There was no room for individual treatment. Imagine, therefore, when these rules were relaxed, the intense joy the early artists had in painting a saint *not* to pattern. Imagine how they would look on the work as a labour of love, and not as an order to make a picture, thinking more of their own ideas than the quality of the work. We should try to remember this when we see the quaint, wry-necked saints of the Sienese school, or Duccio's very badly drawn Madonna with a worse drawn toy Child in her lap.

Another point we should remember is that artists are always influenced by what they are thinking about. The Sienese school grew up just after Dante had written his wonderful allegory, and the visions of the poet had been set free to creep into other men's thoughts. That dear saint, Francis of Assisi, had been going to and fro, preaching and teaching.

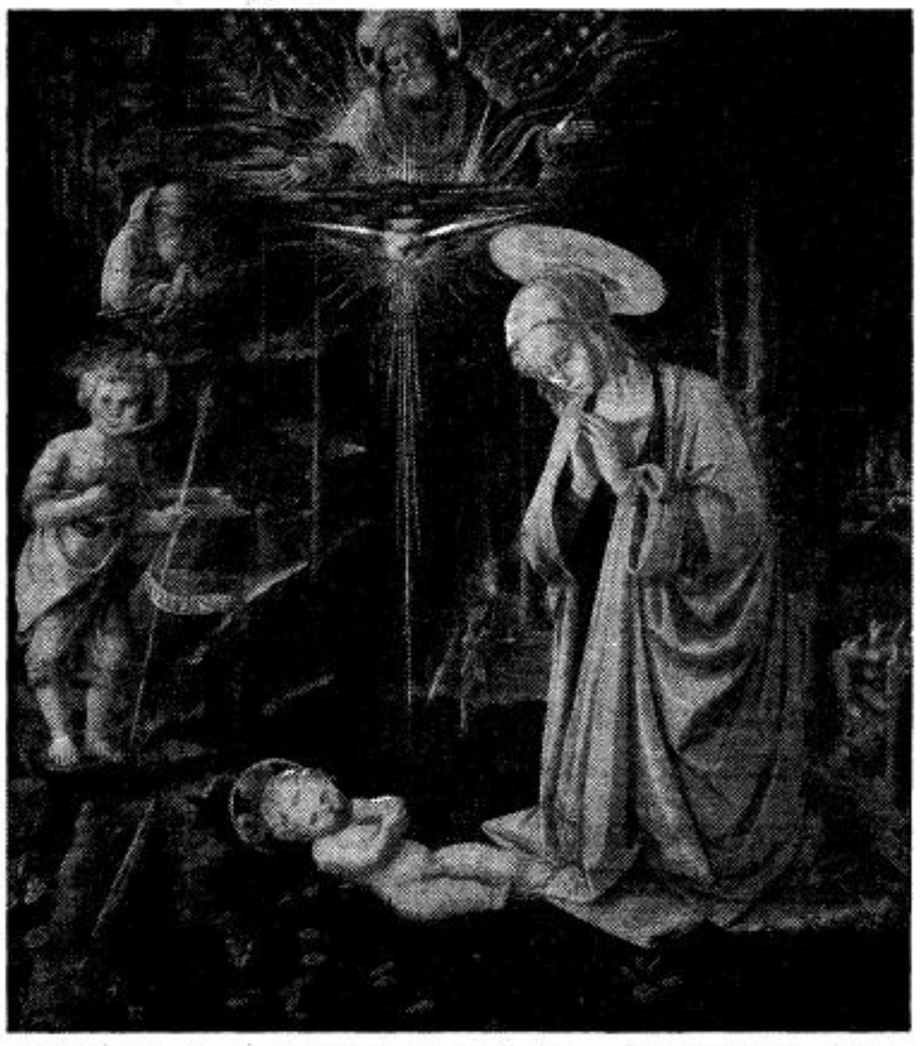
The spiritual life of the thirteenth-century Northern Italy is largely bound up in that good man. He was in literature and religion what the Gothic spirit was in architecture and statuary—something alive and tender, unbound by tradition. To ourselves, now, the book called The Little Flowers of Saint Francis is very precious. What must it have been to have lived in the very place where the

PICTURES BY FOUR ARTISTS OF FLORENCE

BOTTICELLI'S MADONNA AND CHILD

LORENZO DI CREDI'S MADONNA AND CHILD

THE VISITATION—BY DOMENICO GHIRLANDAIO



MADONNA ADORING THE CHILD—BY FILIPPO LIPPI

memory was warm of the saint who spoke of his little sisters the Birds, his big brother the Sun ?

The new joy preached by St. Francis was the secret of the greatness and the weakness of the Sienese artists. Their best work is warm with an individual feeling, a struggle to make a personal, living thing out of lines and colours and tones. They did not think and plan sufficiently, allowing a beautiful emotion to take the place of mental effort. Their greatest artists were Duccio, Simone Martini, known as Memmi, Ambrogio and Pietro Lorenzetti, and Bartolo. After the fourteenth century the art of Siena died out for sheer want of strength and vigour.

Side by side with the Sienese school grew another, the Florentine. A number of pictures showing something of the Sienese spirit have been attributed to Cimabue, the early Florentine, and many charming stories cluster around this captivating figure. But art historians believe that many pictures said to be Cimabue's work were painted by someone else—probably by Duccio or his followers—as the Florentine was a worker in mosaics and followed the Byzantine tradition.

THE MADONNA AND CHILD PAINTED SIX HUNDRED YEARS AGO BY DUCCIO

Florentine art was a very great movement—an intellectual force producing a number of the most wonderful artists of the world, among them two giants—Leonardo da Vinci and Michael Angelo.

The first of the stalwarts was Giotto. He may quite possibly have been influenced by Duccio in the neighbouring town, but he showed in his work the clear precision which was to mark the Florentine school and separate it from the gentle and poetic Sienese.

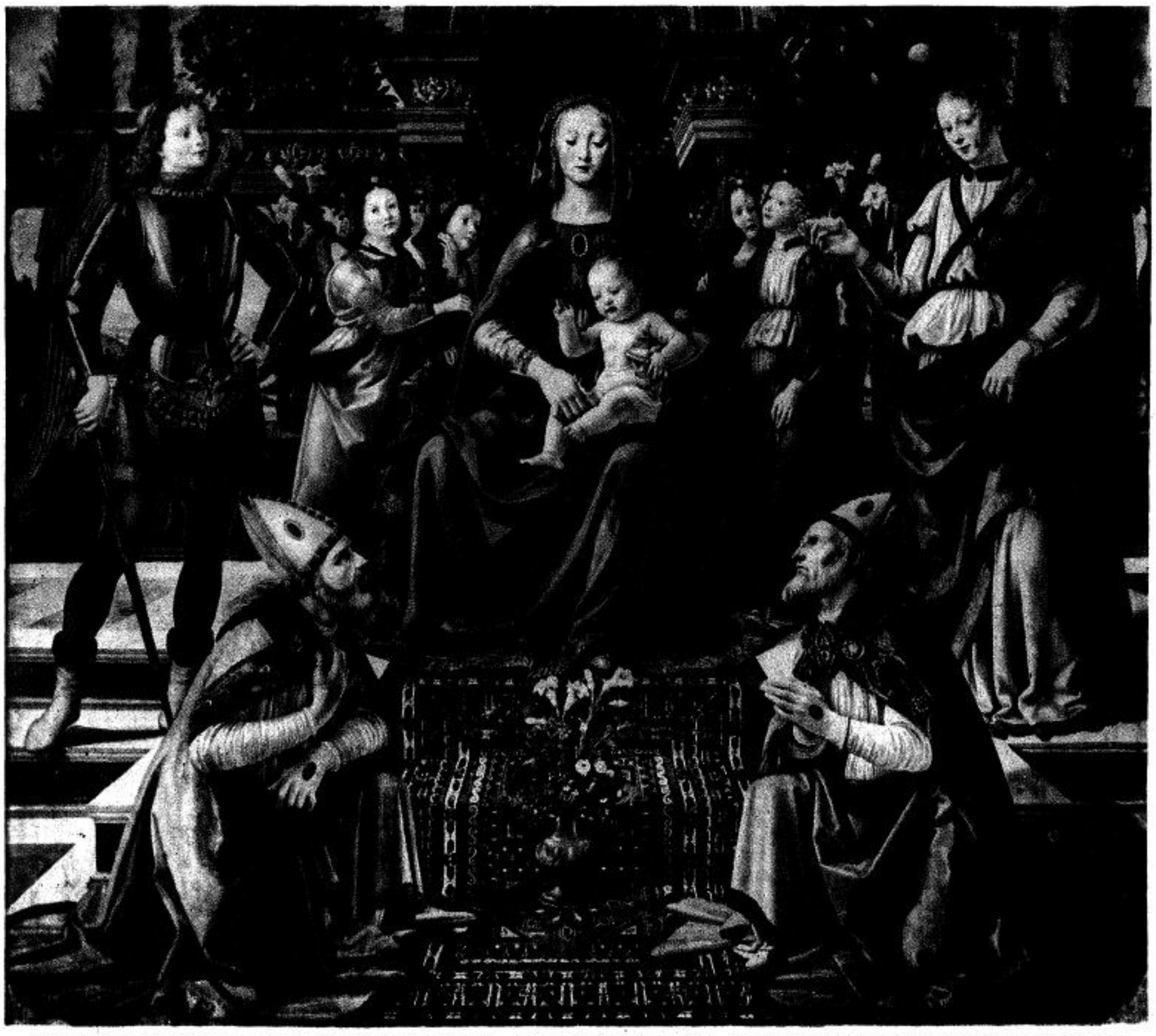
There are many legends about Giotto, one being that he was discovered as a shepherd boy in the mountains, drawing sheep on the rocks ; another that he was apprenticed to a wool merchant and spent his time watching artists at work. Be his origin what it may, Giotto himself is beyond argument a forceful genius with a mind open to all that was beautiful in thought, and with an instinct for what writers call strong situations.

He had a keen dramatic sense, and could seize upon the most vivid actions and attitudes in the people he was painting. Intensely as he cared about his work, he never allowed sympathy to overweigh judgment. For instance, while portraying the grief and horror of some persons at the sudden death of a friend, in one of his great pictures, The Knight of Celano, he still kept his attention clear for the innumerable details of character, dress, and personal appointments which, if treated in the right proportion, make for strength in a picture. Giotto took the second step along the road to the realisation of the Italian ideal of beauty—he turned completely away from the chilling Byzantine traditions which still lingered in the Sienese. When we look at his work we see many faults of drawing, but we see that he battled with the problem of making a projection of colour and shape on a flat surface look as much a solid human being as if it had been sculptured in the round. Giotto's colouring was always clear and pale—another step away from the heavy Byzantine richness.

To understand the work of this pioneer among artists it is necessary to look, not only at his pictures, but at his frescoes in Padua and Assisi, and especially in Florence, remembering that a fresco is painted on the wall itself in water-colour, before the plaster is dry. A great many Italian artists painted in fresco, and, as in the case of Giotto, this class of their work forms a most important study.

Some people are very much disappointed when they go to Italy and see the frescoes of Giotto for the first time ; they are faded, and at first sight appear a little unconvincing.

THE DAWN OF ITALY'S GOLDEN AGE



THE VIRGIN WITH THE INFANT CHRIST. BY GHIRLANDAIO IN THE UFFIZI GALLERY, FLORENCE

AN ALLEGORICAL PICTURE OF SPRING. FROM THE PAINTING BY BOTTICELLI IN THE ANCIENT AND MODERN GALLERY, FLORENCE

TO FACE PAGE 568

THE FLIGHT INTO EGYPT. FROM A PAINTING IN THF ARENA CHAPEL AT PADUA. BY GIOTTO

THE NATIVITY. FROM THE PAINTING IN THE SAN MARCO MUSEUM, FLORENCE. BY FRA ANGELICO

THE VIRGIN WITH THE INFANT JESUS. FROM THE PAINTING BY BOTTICELLI IN THE UFFIZI GALLERY, FLORENCE

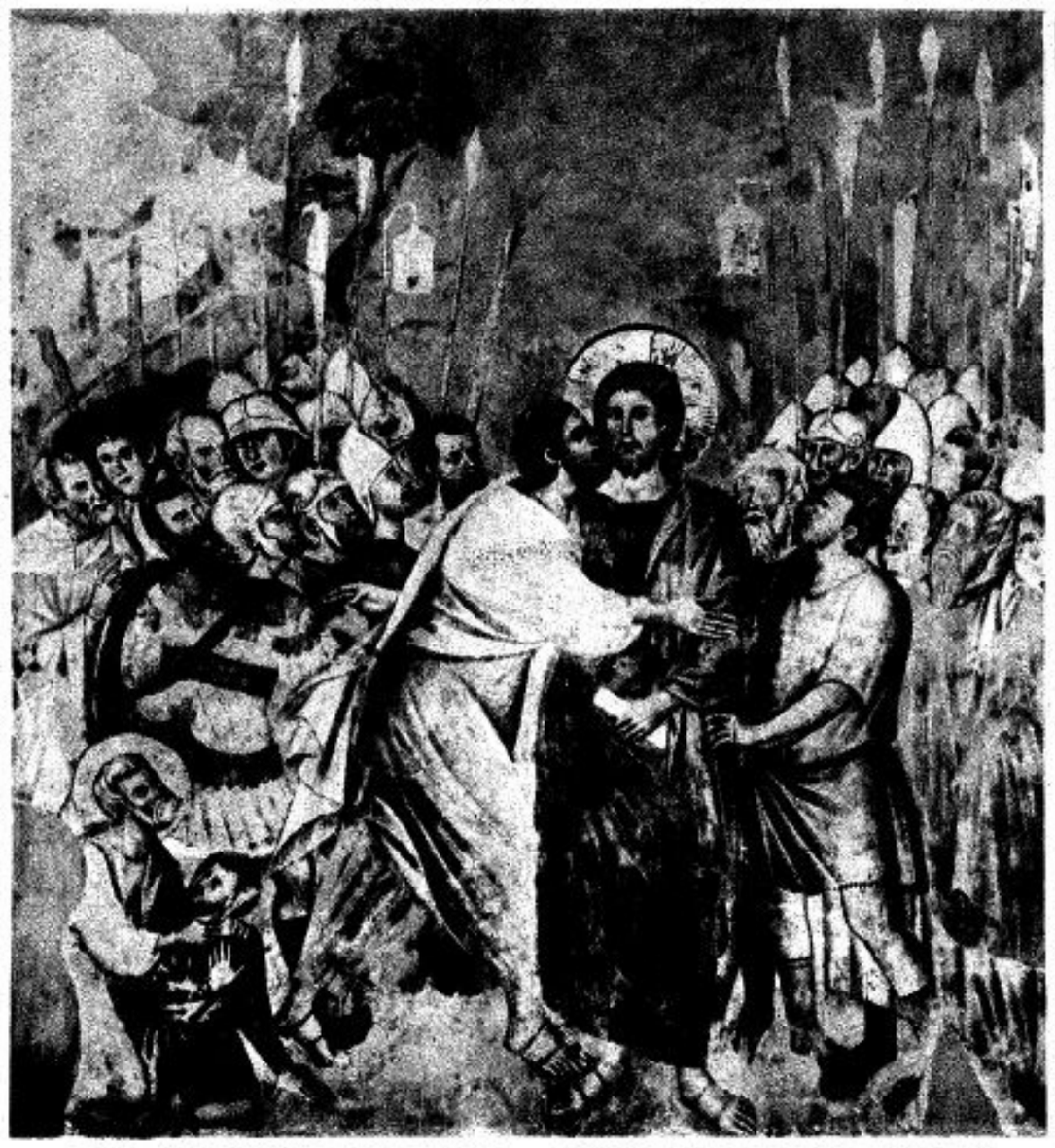
ST. AUGUSTINE READING PHILOSOPHY AT THE SCHOOL OF ROME. FROM THE PAINTING BY BENOZZO GOZZOLI AT SAN GIMIGNANO.

ONE OF THE THREE WISE MEN
BY GOZZOLI

THE ANGEL OF THE
ANNUNCIATION. BY MEMMI

PORTRAIT OF A LADY
BY PIERO DEI FRANCESCA

SAINT FRANCIS
BY BARTOLI TADDEO



THE BETRAYAL BY JUDAS. FROM THE PAINTING BY
CIMABUE IN THE CHURCH OF ST. FRANCIS AT ASSISI

THE VIRGIN. BY
LORENZO DI CREDI

THE DEATH OF SAINT FRANCIS. BY GIOTTO. IN THE CHURCH OF ST. CROCE. FLORENCE

But such people have not learned the lesson we have been learning—of looking at an artist's work from the point of view of the painter and the period. Keeping that in our minds, we can never make a wrong judgment, and we should not at the outset expect the brilliance of a modern oil painting in plaster pictures which have been exposed to light and heat for close on a thousand years, and were painted by a man who, though a great genius, could not draw properly.

THE IMMORTAL GIOTTO WHO "TOOK HILLS AT A STRIDE"

Most of Giotto's frescoes are subjects from the life of St. Francis, cycles of beautiful stories. They adorn churches in Florence, Assisi, Padua, and Rome. One of Giotto's paintings is in the Louvre, another in the Munich gallery. England has nothing at all of this immortal artist's work.

Giotto died in 1337, but he really lived on over a hundred years, seeing that it took many generations before painters reached the point where his progress was stayed. Giotto had taken hills at a stride. His followers plodded on, content merely to try to "catch up." They imitated and copied his style and work and developed little or nothing on their own account. They were a numerous company, and are known in art history as the Giotteschi.

The chief among them and the next best to the master was Andrea Orcagna. Another, Taddeo Gaddi, Giotto's favourite pupil and his godson, rather caricatured his master's style, exaggerating the long noses and faces and almond eyes which Giotto had introduced in place of the staring, round-faced Byzantine personations. But he was humble, and knew his limitations. Sometimes he signed his work, "Taddeo, a disciple of Giotto, the good master."

FRA ANGELICO, THE GENTLE PAINTER WHO WEPT OVER HIS WORK

After Orcagna and Gaddi, perhaps the best of the Giotteschi was Giovanni da Milano; then came Cennino Cennini, Andrea da Firenze, Antonio Veneziano, Spinella Aretino, Lorenzo Monaco. One of these men, Cennini, is chiefly remembered for a book on painting that he wrote, describing, among other things, Giotto's technique, and incidentally throwing a light on Tuscan habits and customs of the thirteenth century.

The greatest artist produced by the Giotto school was the famous monk Fra Angelico of Fiesole, who lived from 1387 to 1455. He was a gentle and saintly painter, who felt intensely the inwardness of all the subjects he portrayed and would frequently weep over his work. Fra Angelico's work lacks the strength of Giotto's, but it has a devoutness almost unrivalled. He accomplished an amazing amount of work and comparatively little of it has survived. One of the treasures of the National Gallery is the predella for his altar picture *Christ in Glory*, which was painted for the church of St. Domenico in Fiesole, the hill-top village above Florence. This panel picture is a wonderful and lovely thing, one of the rare flowers of the Renaissance.

Perhaps Fra Angelico used a little too much gold, because he thought that nothing short of gold was rich enough for portraits of Christ and the saints. In this way his work reminds us of the Sienese. But his careful composition and construction of figures is far indeed from the vagueness of the Primitives.

Fra Angelico's most favourite subject was the Annunciation; another theme he often painted was the Last Judgment. He was perhaps most happy in his pictures of Paradise. Earthly loves and hates existed not for him; all his affections soared outward to the heavenly land.

THE EXQUISITE PAINTER OF MAGICAL AND BEAUTIFUL EVENTS

Fra Angelico's pupil Benozzo Gozzoli was an idealist of another kind, loving to picture earthly as well as heavenly things. He has been called the most exquisite storyteller of the Renaissance, a painter of frescoes in which magical and beautiful events are shown. There was a slight tendency in master and pupil to make art visionary and apart from real life, Fra Angelico being first a saint and then a painter and Gozzoli more an illustrator than either. Two of Gozzoli's pictures are in the National Gallery, and from them we can learn something of his style. While Benozzo was but a child, however, a man was working who in his short life—he died in 1428 at the age of 27—brought a very different influence to bear on Florentine art. This was Masaccio.

Masaccio's work was like a powerful, salt-nipped wind blowing through a languorous garden. He was very vigorous and realistic, explaining by his work that art should explain life, that life is not an affair of dreams, and that Nature is the mistress of all masters. In Italian art, Masaccio

was the next strong force after Giotto; and like him, he influenced a century of followers.

Masaccio's greatest work was the decoration in fresco of the Brancacci Chapel of the Carmine monks in Florence. The subjects are various—the Fall of Man, the Expulsion from Paradise, and then onwards, skipping the rest of the Bible to the Acts of the Apostles. This work makes an epoch in art. It is one of the stages by which progress can be counted. One of the pictures best showing Masaccio's strength is the expulsion from Paradise. It is a grievous thing that Masaccio, like Giotto, should be unrepresented in an English gallery.

BOTTICELLI, WHO WOULD SACRIFICE JUDGMENT FOR HIS LOVE OF LINE

Artists of varying qualities were influenced by Masaccio. There was Filippo Lippi, whose work showed a curious mixture of Fra Angelico's saintliness and Masaccio's realism. One of Lippi's pupils was Botticelli, who has perhaps been loved a little more than he deserves.

Botticelli was uneven in his work, allowing himself to be swayed by his passion for a lovely line; and in order to achieve this he sometimes sacrificed both judgment and reason. At his best, as in the Allegory of Spring in the Florence Academy, he is a very fine product of the Tuscan school, but his best does not often happen. Like all the Italians, he painted many Madonnas and kindred subjects, and numerous artists after him worked in his manner. Six of his pictures of Mary and the little Jesus are in the National Gallery, and show all his virtues and failings in one group. Botticelli was a little like an organist who uses the Vox Humana stop too frequently.

THE GREAT VARIETY OF THE PICTURES OF PIERO DI COSIMO

Piero di Cosimo, whose work is not at first sight as attractive as Botticelli's, was really a much stronger artist. His Death of Procris in the National Gallery is said by some people to be the finest picture there; but that is a matter of opinion. Another very fine picture of his, also in our collection, is a portrait of a Florentine general. The paintings of Cosimo are an excellent study to lead up to the work of the great Leonardo da Vinci, who was his contemporary. He painted all kinds of subjects, classical and Biblical; he also painted exquisite portraits, of which La Bella Simonetta—a beautiful Genoese girl whom Botticelli also painted—is the most famous. There was a mingled delicacy and strength and distinction in Cosimo's work that marked it out even in a century of great artists.

Two more Florentines call for mention—Domenico Ghirlandaio and Lorenzo di Credi. Ghirlandaio, much the stronger artist of the two, was living at the same time as Botticelli, and shared with him many of the commissions upon which artists depended then, as now. Ghirlandaio had a strong instinct for large compositions, and he painted in vivid and clear colour. He had an extraordinary capacity for work, and was said to declare that he would like to paint all the walls of Florence in fresco. Naturally he fell short of this achievement, but in the forty years of his life he accomplished a great deal. He was content to paint subjects as subjects, people as people,; he had no spiritual insight, and thus his work is marked by none of the idealism that distinguishes other men of his century. As decoration it is very fine, however.

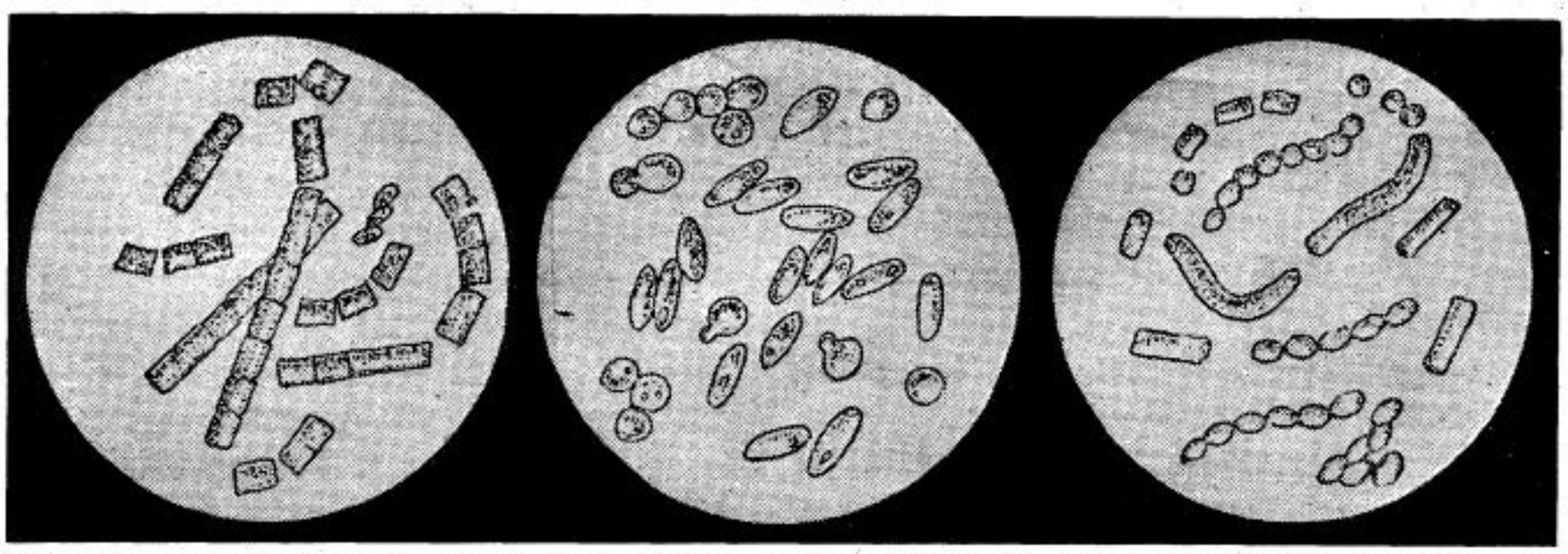
LORENZO DI CREDI WITH THE GHOST OF THE GREAT LEONARDO WITHIN HIM

Lorenzo di Credi was the fellow student of the great Leonardo da Vinci. Two of his pictures of the Madonna are in the National Gallery, and there we can see, when we have learned to judge this illustrious company of Florentines, that Lorenzo was a good second best. Like most of the men of his time, he ardently admired Leonardo and studied his style. Perhaps it may be said that a ghost of the other's greatness hides in di Credi's work.

Another artist who lived in this amazing fifteenth century was Piero dei Franceschi, the Umbrian. His work was strangely cold and aloof; he preferred strength to beauty. Luca Signorelli was his pupil, and he had a strong feeling for composition for its own sake, regardless of individual figures. Three of Franceschi's and five of Signorelli's pictures are in the National Gallery.

After a little patience in sorting out these names and getting used to the idea of Italian art, we shall see how the work of the Florentine painters grew. It was a truly miraculous development, the mystical, unskilled Sienese and the adventurous, intellectual Florentines following one after another, until Leonardo came, and Michael Angelo.

The Wonderful House We Live In, and Our Place in the World



Microbes of all shapes and sizes occur in Nature, and all have their particular chemical qualities. In these three circles are seen, enlarged about a thousand times, some of the many microbes found in milk, butter, cream, and vinegar. Some turn milk and wine sour; and some give flavour to cheeses.

THE TINIEST LIVING THINGS

We have to talk now about the simplest kinds of living creatures that we know, and about the things they do, not only because they are very interesting in themselves, but also because their life affects the story of the Earth, which they are constantly helping to change in many ways.

These living things are extremely small; they have many names, and are often called *germs*—the germs of disease. But the great Frenchman Pasteur who found out that some of these things often make us ill called them *microbes*, a word which really means small life.

As they so often make us ill, most people think all microbes are evil, but only a very few microbes make us ill. By far the greater number of the microbes are not merely harmless to us, but we could not live without them.

The first thing to learn about microbes is that they are very small—so small that unless we have some way to help our eyes we can never see them; and, indeed, some people believe that there are many microbes so small that, however much we help our eyes, we cannot see them.

Men, therefore, could not know that microbes existed until the invention of the wonderful instrument called the microscope—an arrangement of pieces of glass in a tube, which magnifies small things so that we can see them. Yet even the microscope would not be sufficient alone to show us how many kinds of microbes there are, and to teach us that they are almost everywhere. They abound in ordinary air, they are on everything you can touch, in the house or out of doors, and they have even been found in the snow in the Arctic regions. They are to be found in all water. So practically they are everywhere—tiny living creatures, living their own lives, and employed in doing things all the time.

It is a very easy thing to grow microbes. You may take a few by dipping the point of a needle in something containing them, and then put them into milk—one of the best things for growing microbes in—or you may stroke the needle across the cut surface of a potato; and in many other ways you can watch microbes growing. You cannot see the separate microbes with the naked eye, but you can see a colony of them, and, as different kinds have different ways of spreading, anyone who knows them can pick up the tubes in which they are growing and say what kind of microbe a tube contains.

Microbes are too small for us to see their structure, but they seem to be all made very much alike. Every microbe simply consists of one little piece of living matter, called a *cell*. That is its

whole body, and does all the work of a living creature for it. Some microbes are round, and some are like little short rods; some are very thick, and some, like those which cause influenza and consumption, are very slender; but all microbes, whether harmless or dangerous, and wherever they live, consist of a single cell, as it is called.

YOU COULD PUT A HUNDRED MILLION MICROBES ON A SHILLING

It is very important to realise that a complete living creature which moves and grows can do these things, even though it has no mouth, or lungs, or muscles. We have to learn that many of the things we do by means of many different parts of our body made specially for the purpose can be done by living creatures that simply consist of a single living cell, which, so far as we can see, is the same throughout, and in which no different parts at all can be observed.

When they are growing in one place perhaps they are round or very short, but when they are growing in other surroundings they may become long or thin. This is very likely a question of the kind of food they get, and it reminds us that the people who grow up in the slums are usually very short, while people who have good food and grow up in fresh air are generally many inches taller.

Considering the great things they do, the smallness of microbes is wonderful. A fair average size would be a twenty-thousandth part of an inch across. If you took some of the little rod-like microbes and could place them end to end, nearly ten millions would be required to reach a yard, while a hundred millions would be necessary to cover a shilling in a single layer, and 640,000 billions to make a solid cubic inch. (You know that a billion is a million millions, do you not?)

SEEING A THING TEN THOUSAND TIMES ITS LENGTH

This gives us some idea how tiny these tiniest of living things are, and we should not forget that there may be many others which are tinier still, so that we cannot even see them with microscopes, which are able to make a thing look ten thousand times as long as it really is. When a microbe has reached its full size—though that is not much to boast of—it does not stop feeding and growing, but splits into two. Now, there must be some reason why a living cell, which is quite strong and young and has plenty of food, never goes on growing and growing without limit, but always after a certain point either stops growing altogether and gets no bigger, or else splits into two cells.

The rate at which microbes grow and multiply can scarcely be believed. Starting with only one microbe, and giving it sufficient food, in only twelve hours we should have something like eighteen millions, and six hours later we should have nearly eighty thousand millions. All this would simply be the result of taking in food, growing and dividing, and repeating the process at a tremendous rate. They cannot grow unless they get enough food of the right kind, and this is far from always being the case.

Microbes grow at rates something like this when we cultivate them on purpose, and give them the kind of food they like best; and also, unfortunately, they multiply like this sometimes when they attack us and make us ill, especially in the case of people whose bodies are just suited for microbes to grow in.

MICROBES THAT ARE REALLY PLANTS BUT LIVE LIKE ANIMALS

But we must understand that not many kinds of microbes can grow in our bodies at all, and that most of them are killed at once when they enter our bodies. It is also well to remember that there are certain kinds of microbes which our bodies will kill at once if we take care of our health and live sensibly, but which may kill us if we have been doing foolish things and so have lessened our powers of protecting ourselves from these enemies.

The various shapes of microbes, we have said, matter very little, but what does matter a great deal is the two different kinds of ways in which microbes feed, and this we must very carefully understand. Microbes belong, on the whole, to the vegetable world rather than the animal world, but though they are really tiny plants none of them contains any of the green matter which enables plants to live on air as well as to breathe air. Therefore, so far as their feeding is concerned, microbes are in the same position as animals. They are all compelled, like animals, to live upon food furnished them by the bodies of other living creatures.

This is the great mark of microbes—that they live upon the bodies, either alive or dead, of other living things. These may be animal or vegetable. The great

distinction between microbes is that some of them live merely on the dead remains of living things, while others will attack and feed upon other creatures, animal or vegetable, when they are still alive. Here we will speak of those much more numerous microbes which live on dead matter, though always matter that has once been alive. These play a great part in the world, and, indeed, we could not possibly live without them.

Consider how many countless millions of living creatures, human, animal, and vegetable, are on the Earth, and in the air, and in the sea, at this moment. For untold ages this has been so. Yet, as we know, these creatures die, and those who came before them have been dying in countless numbers every day for ages past. Now, if we consider for a moment, we shall see that if there were no means by which the bodies of all these creatures were disposed of, the Earth must long ago have been heaped up with them.

The truth is that life simply could not go on if there were not something at work which, all the time, is taking the bodies of plants and animals as they die, and doing something to them, so that they simply disappear and are got out of the way. But, more than this, there is something at work which takes these bodies—in themselves dangerous and disagreeable—and turns them into simple materials which are used as food by the new creatures living at any time.

We see in the story of Plant Life how microbes take the dead leaves in the autumn and turn them into stuff which can be used for making new leaves in the next spring. Microbes, then, do for the dead bodies of all living things what they do for the dead leaves. They keep the world young and fresh and green. It has very often been said that they are scavengers, meaning that they are like the men who empty the dustbins and keep the streets clear of all refuse. Microbes do this, it is true; but that is only the beginning of their work, and not nearly the most wonderful part of it. Far more wonderful is the way in which, living their own lives, they take things which would be disagreeable, or which, at the least, would be useless and cumber the Earth, and turn them into the sources of new life.

One of the most important lessons we have to learn is that there is really nothing useless in the world. Microbes are the humblest kinds of living creatures, but they are not contemptible. Without the work they do in the course of their humble and unnoticed lives, no higher form of life upon the Earth, vegetable or animal or human, would be possible.

We can get some idea of the unceasing way in which these microbes are everywhere doing their work if we examine ordinary earth and find how many microbes it contains. One grain of ordinary earth will contain anything from one thousand to three hundred thousand microbes, their number being greatest in earth in which many plants are growing. If we think of the thousands of microbes in a single grain of earth, and think how tiny that quantity is, we begin to realise that it is not possible to say how many microbes there are in the world.

Our microbe enemies enlarged 1000 times. The first are the microbes that cause cholera, the second cause consumption, the third cause typhoid fever, and the last cause lockjaw.

A microbe beginning | About five minutes later | After 15 minutes | It grows into two | Both begin to develop | Both form "waists" | The two become four | At the end of an hour

THE WONDERFUL WAY IN WHICH MICROBES ARE BORN WHILE WE LOOK AT THEM